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approach

THE NAVAL AVIATION SAFETY REVIEW

○ Midairs ○ RAMP STRIKE! ○

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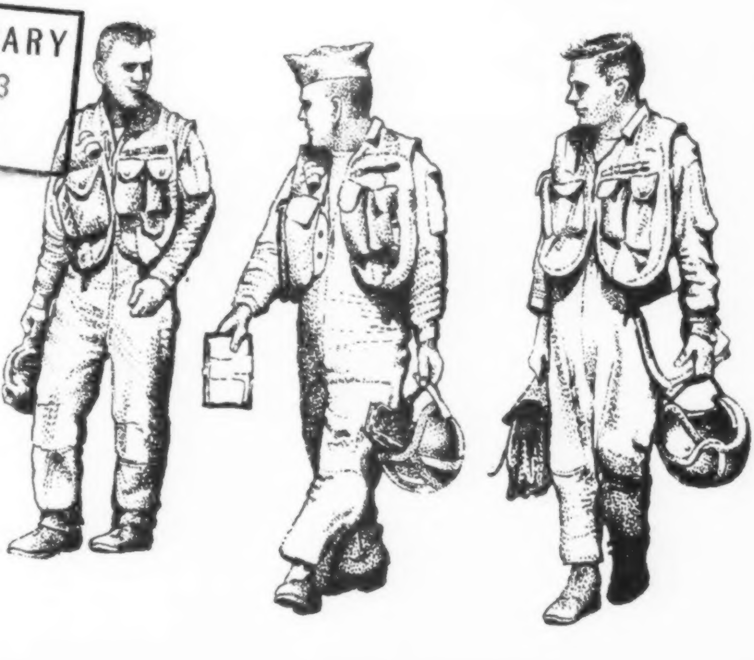
Preventing FOD ○ JUST a COLD

The Great Murgatroyd Frunch Scandal



FEBRUARY 1963

Just
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by LCDR J. R. Foster

Ramp Strike!

Landing accidents account for nearly half of all naval aviation accidents and a type of landing accident which continues to occur at an alarming rate is the ramp strike. By necessity, all carrier aviators must fly over a man-made steel "cliff," some 60 feet in height and just 100 feet from the landing point on every carrier landing approach. Night and day this formidable barrier presents itself. Even with modern landing aids such as the mirror, the Fresnel Lens, the Plat System and, of course, the LSO, holding a light switch and mike in place of his paddles, pilots of high-performance aircraft fail at times to make the flight deck level.

With glide slope information continuously transmitted to the pilot and a qualified LSO observing each pass and capable of initiating an immediate waveoff, how does a pilot allow himself to fly into the ramp? The factors are many and varied but ultimately the final controlling factor is the pilot.

Let's take a look at some recent ramp strikes and note the lessons to be learned.

The Case of The No. 1 Wire

The pilot was on his fifth approach during night CarQuals. He had a total of two night arrestments. The approach was on speed, on altitude and line-up was good until just short of the deck. An amber approach light had been observed until a slight fast or red approach light was seen as the aircraft was close in to the ramp. The LSO had transmitted during the approach, "no lower; hold up your nose, power, power" SPN-12 recorded an airspeed of 142 knots. The aircraft struck the rounddown of the carrier deck with the main landing gear and as it skidded up the deck, flashes and muffled explosions were observed. The plane settled off the angled deck and the pilot was not recovered.

During day refresher landings this pilot was consistently trapped by the No. 1 cross-deck pendant. This was the result of the pilot being low at the ramp and spotting the deck. The LSO had continuously stressed this to the pilot on his debriefings which included reviewing the PLAT System Monitor. This pilot chose to disregard available glide slope information during the final portion of his approach even after being warned of the possible consequences.

Another important aspect is the illusions that sometimes present themselves during a night approach. One illusion faced by the pilot is that he is high and possibly will land long. This usually occurs in the very final stage of the approach and is the result of deck lighting in the landing area and the absence of reference points normally observed during a day approach.

The more important illusion is the location of the ramp lights. By nomenclature and location it is assumed that they identify the stern of the ship. During the approach the pilot observes these lights until close in at which time they are lost because of restricted visibility from the cockpit. The stimulus re-

Watch those illusions, especially at night.

ceived from the peripheral vision of the pilot tells him the ramp lights are no longer visible and that therefore he is clear of the ramp. Training and knowledge should override this stimulus being fed to the pilot and he should disregard it and continue the approach utilizing the glide slope information available. Unfortunately, if at the exact moment that this stimulus occurs the pilot dives-for-the-deck or eases the nose over to prevent that night bolter he will not make it over the ramp successfully as demonstrated by this accident.

The Case of the Low Ball

The catapult shot and rendezvous were normal. During climbout, the pilot noticed the cockpit temperature was colder than normal, but was endurable. On his first approach the pilot was waved off due to a high start. On his second approach the pilot again had a high start and at 1½ miles was advised by the LSO to start his rate of descent. The pilot corrected down to glide slope and then passed through it, stopping with a low ball. The LSO asked for power to correct his glide slope. The pilot added power to slow his rate of descent but did not correct for the low ball.

As the aircraft passed through the stack burble, the LSO asked for more power. At this point the aircraft started to decelerate and power was once again called for by the LSO. No improvement was noted and power-call was made three times in rapid succession by the LSO. Shortly thereafter the aircraft struck the ramp. The aircraft continued up the deck and made a normal engagement of the No. 2 cross-deck pendant.

This accident occurred simply because the pilot failed to properly control the aircraft on the mirror glide slope even with supplementary information from the LSO. The accident board also stated the failure of the cockpit air conditioning system contributed to the accident by its adverse physiological effects on the pilot.

Line-Up

The aircraft approached the ship and was approximately on centerline and at the correct altitude. The pilot called the "meatball" at which time the LSO detected the aircraft going low. The pilot corrected back to the glide slope and the LSO then

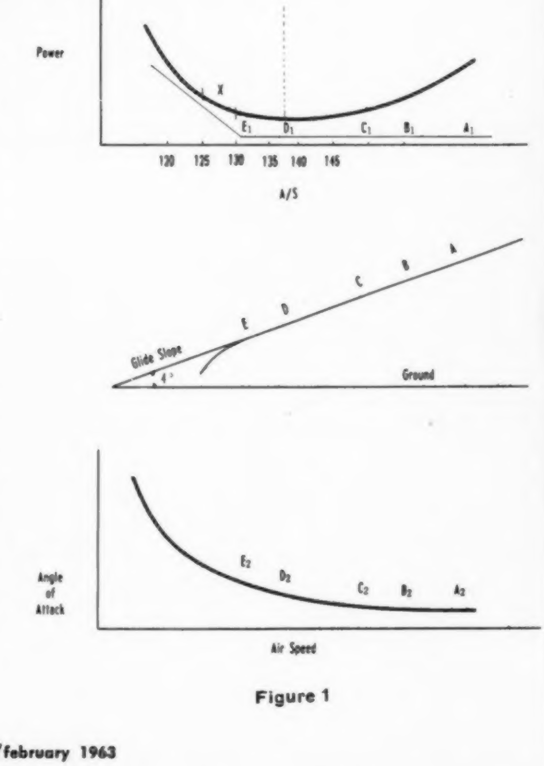


Figure 1

noticed some deceleration. A call for power was made. The aircraft was observed at this time with a red approach light. During the final moments of the approach, the aircraft was observed to be low and the LSO made several "power" transmissions, followed immediately with a waveoff. The aircraft struck the ramp 3 feet below the flight deck and well to the right of centerline in a wings-level attitude. Afterburner was selected shortly after striking the ramp and the aircraft became safely airborne. The pilot made a barricade arrestment on his next pass.

This pilot also neglected his glide slope information and directed his attention to only one phase of the approach, line-up, at a critical point.

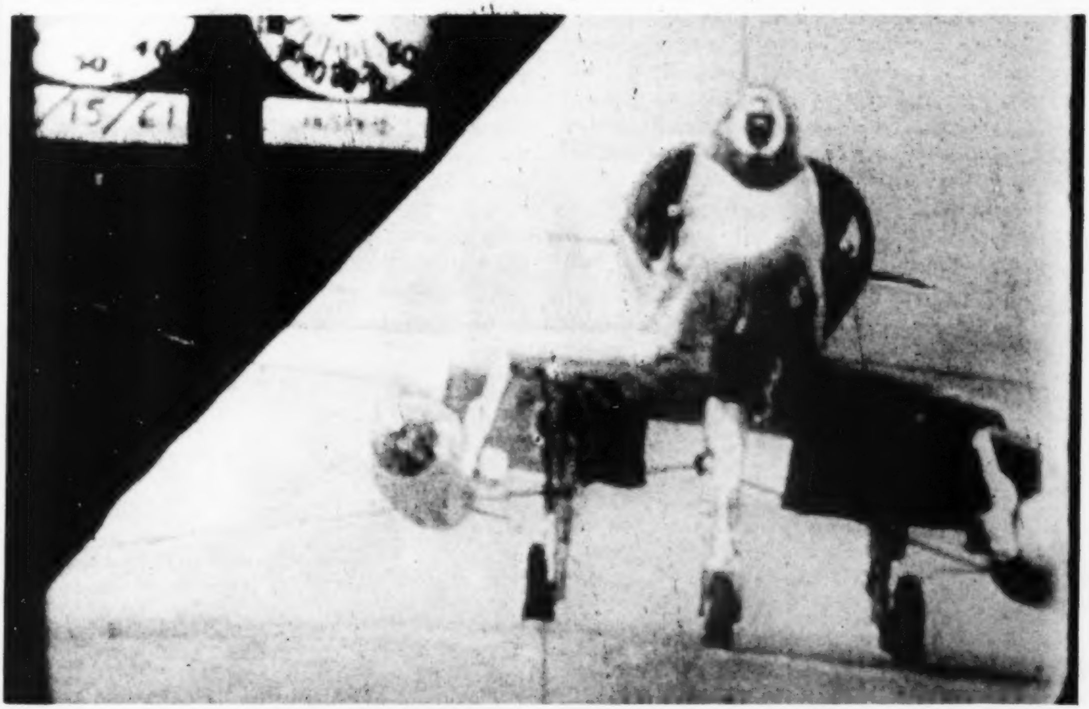
High and Fast

The pilot had completed a normal CCA and reported sighting meatball at 1¼ miles. An LSO in training, who was controlling the approach, noted the aircraft was high and fast. At about 1 mile from the ship the aircraft began a rapid rate of descent. The supervising LSO told the LSO in training to get rid of him because he was too fast—wave him off. As the aircraft continued to close the ship, the SPN-12 radar indicated a smooth deceleration. At about ½ mile the aircraft descended well below the glide slope. At this time the pilot realized his high sink rate and began to add power. The LSO transmitted "no lower—no lower—power, power, power." The aircraft struck the ramp about 2 seconds later.

This pilot committed an error which has probably been responsible for more ramp strikes than any other—the high fast start.

The following discussion on the high fast start is quoted from the NASC publication "Final Approach" originally distributed June '59.

"The fast start causes the pilot to control the altitude with the stick in order to stay on the glide slope as he hacks off power to try to slow down. If he attains the correct airspeed with the stick he is hopelessly high on the glide slope, he has to pay for the slower speed by maintaining or gaining altitude—even with all his garbage out. So the pilot is fast, staying on the glide slope with his stick, keeping the power excessively low in order to bleed off speed. What happens? See figure 1.



Thanks to PLAT tailhookers now have an accurate and readily available debriefing medium, free of estimates and human opinions.

1. The pilot starts down the glide slope at Position A. He is fast with power as shown at A1, his angle of attack as shown at A2.

2. With the reduced power setting he slows down. As he slows he must change the angle of attack in order to stay on the glide slope. Positions B, B1, B2; C, C1, Cs; D1, D2 shows this progress in flight path, power required, and angle of attack.

3. At Position E the pilot sees his airspeed dropping, and he knows that he will need power; so he adds it.

4. Here, a number of factors can take over—and these are reflected in many AARs. We list three here:

a. At E he adds power. He was decelerating rapidly. In order to hold the glide slope he is hauling back on the stick (he has been controlling altitude with the stick—he had to). The drag is increasing at a terrific rate at the high angles of attack so that *his need for additional power is increasing as fast as his engine will accelerate.* He is in such a position that the only way he can go is down, down below the glide slope. He hit the ramp.

b. At E the pilot anticipates 83% he usually needs at Point X on the power-required curve. He puts on the 83% and confidently waits. It's a little warmer than usual. The port wing didn't dump all the fuel. In short, for various reasons about 85% to 86% is needed. The pilot finds himself at speed X' with a slight power deficiency, decelerating AND easing his nose up to stay on the glide slope—after all, that is the way he had been holding on glide slope all the way down.

The drag went up; so did the power, but not fast enough. This boy was lucky. He hit the ramp with the end of his aircraft, knocked off the hook, bent the tail cone, but he managed to bolter and made it to a land base.

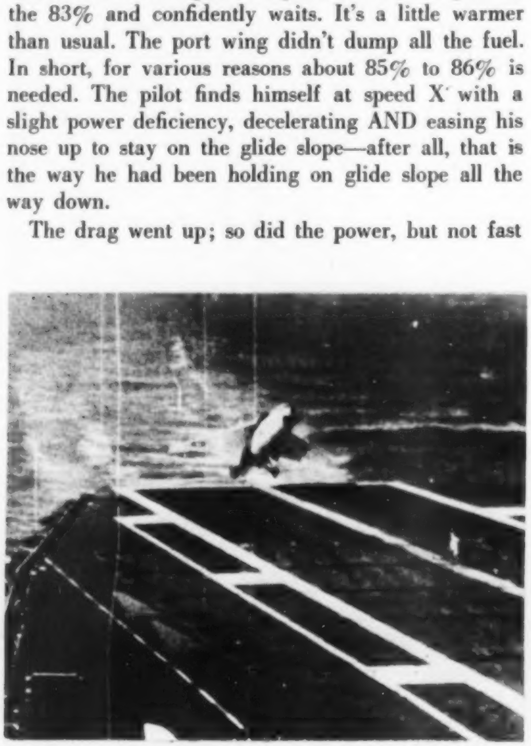
c. At E the pilot guessed right. He adds the right amount of power, and lucks in. He tells all the pilots that he made it because he knows what he is doing, and he encourages the youngsters to try it. We'll get the AARs on the youngsters he convinces—*and eventually we'll get his, too.*"

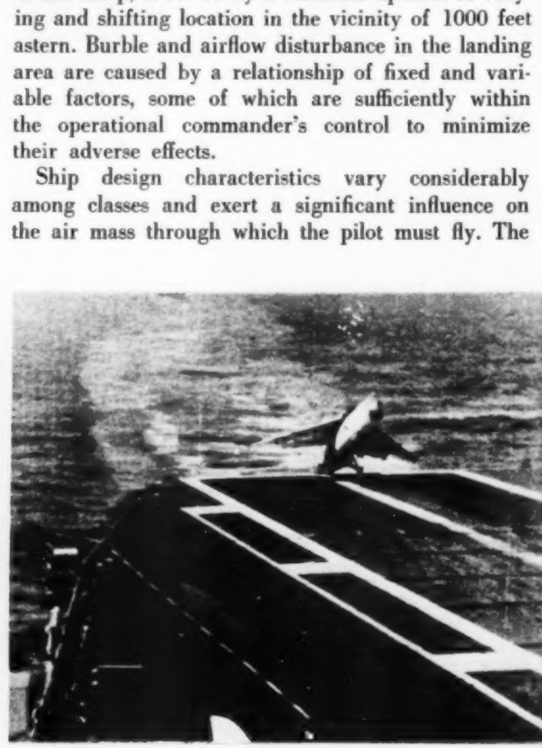
Wind-Over-Deck

Much has been said about the airflow disturbance aft of the ramp or burble and its effect on carrier approaches. The following quote is taken from the NATC Final Report on Project No. RSSH-31008, *Optimum Wind-Over-Deck for Shipboard Recovery Operations with Carrier Based Airplanes:*

"Airflow disturbance aft of the ramp and in the landing area is one of the most significant adverse influences on the pilot's ability to make a precise final approach and landing. Airflow disturbances aft of the ramp, or burble, may be generally described as a downdraft of varying intensity immediately aft of the ramp, followed by a resultant updraft of varying and shifting location in the vicinity of 1000 feet astern. Burble and airflow disturbance in the landing area are caused by a relationship of fixed and variable factors, some of which are sufficiently within the operational commander's control to minimize their adverse effects.

Ship design characteristics vary considerably among classes and exert a significant influence on the air mass through which the pilot must fly. The





magnitude and direction of the WOD is the most significant variable influencing airflow disturbances. It has been determined that for a given magnitude of WOD that the airflow in the landing area is steadiest when the relative wind direction is parallel to the angled deck centerline. Starboard recovery crosswinds are accompanied by relative wind velocities in the landing area considerably lower than those recorded by superstructure mounted anemometers. Airflow conditions in the landing area improve when the magnitude of the WOD is reduced. The burble aft of the ramp becomes stronger when the magnitude of the WOD increases; the angle between the relative wind and the angle-deck centerline increases; the natural wind component increases for a given WOD. Other variable factors influencing airflow disturbance include flight deck spot, aircraft exhaust or prop wash over the deck and natural turbulence.

Glide slope and lateral corrections required by the pilot increase with increased WOD. Upon first entering the burble with the high WOD (above 35 kts) airplanes generally experience a significant upward displacement from the glide slope followed by a downward displacement near the carrier ramp. The downdraft effect is also a function of the airplane's position on the glide slope at the time of transiting the downdraft; a low position results in a deeper penetration of the burble and maximum downdraft effect. All pilots reported that regardless of the model airplane being flown, the tendency for the airplane to go low on the glide slope increased considerably as WOD increased above 25 kts and 15 kts for jet and propeller airplanes, respectively. The pilot control requirement is greater for low approach airspeed and lower wing loading airplanes.

To counteract the tendency of the airplane to go low during high values of WOD, all pilots anticipated the effects of downdraft by adding power approximately 400 feet from the ramp. The amount of power addition varied among airplanes of different models. Generally, an increase of about 4-6% rpm was sufficient to maintain glide slope for jet airplanes at WOD values in excess of 25 knots."

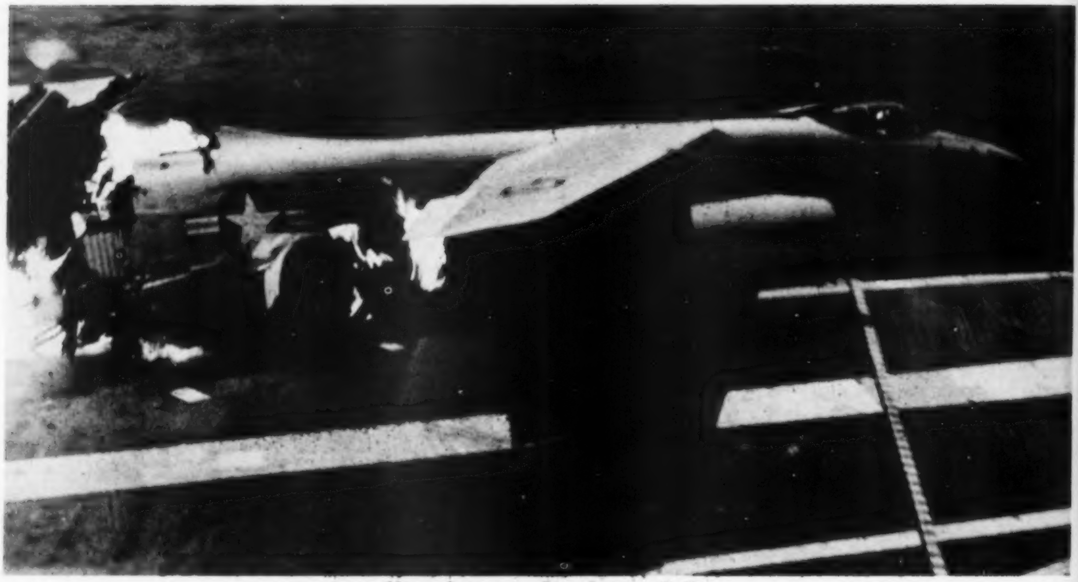
It is urged that all carrier aviators read this study thoroughly for its excellent discussion of the influences of this airflow disturbance on the carrier approach and landing.

Some Basic Conclusions

This short rehash of ramp strikes is intended only to bring to mind some of the more common errors made in the past, and which are still being made at present, in an attempt to eliminate them in the future.

Making a good carrier approach everytime, day or night, is the hallmark of a naval aviator. It doesn't come easy. There is no magic formula or short cut to reach this goal. Training, practice and the constant desire of the individual to make each and every approach and landing a perfect one is the first step. Maintaining complete timely knowledge of the factors affecting the approach is a continual process.

• Fly the glide slope all the way down to the deck. It will put you at the right place at the right time for a safe arrestment. Don't be content with anything



Never, but never, fly a low meatball!

except a centered meatball all the way. You can't miss.

• Watch those illusions especially at night. Believe the glide slope info on the approach as you do your instruments during instrument flight conditions. Easing the power off or the nose over at the ramp because of an illusion of being high or the desire to get aboard without a bolter on a dark night is asking for a piece of ramp. Power and plenty of it is the proper correction for a dropping meatball near the ramp.

• Concentrate on the *whole* approach at all times. Don't direct your attention to one part, such as line-up, at the expense of ignoring glide slope information especially during the last few seconds of the approach. Keep those last minute corrections small and smooth. Large ones will be unnecessary if you've been flying a good approach from the start.

• Beware of high fast starts. Reducing power to slow down and controlling the altitude with stick to get down to the glide slope can result in the bottom falling out of the approach at the ramp. It's happened before. The perfect approach calls for being set up at the very beginning of the approach. Minor corrections *only* should be necessary when you're coming down the glide slope.

• Know the peculiarities of your aircraft when it's in the landing configuration and at the speeds normally used in the approach. This includes having a thorough understanding of the aerodynamics involved for the aircraft descending on the glide slope.

• Be ready for a waveoff during the final phase of the approach. Be wary of the natural inclination to haul the nose up for a waveoff especially when approaching the backside of the power-required curve.

• Be attentive to the information you receive from the LSO both during the approach and in his debriefing. There are more old pilots around who have heeded his advice than there are those who did not. The gent back on the platform is there because he knows the business. His function is not to fly your approach but to aid you in a timely manner. With the advent of PLAT the LSO can now show you as well as tell you your errors immediately after they happen.

• Review the written word on the carrier approach. Your operations officer can supply you with many fine Naval Air Test Center reports. The reader is also referred to the following information:

"Mirror Report" (APPROACH April '57)
"Meatball and Paddles" (APPROACH Jun '58)
"The Pilot vs. the Pitching Deck" (APPROACH Nov '60)
"The Other Way To Stop" (APPROACH Feb '61)
"Carrier Landing Facts" (NavWeps 00-80J-1)
"The Carrier Landing Story" (APPROACH July '61)
"The Late Waveoff in Jet Aircraft" (APPROACH Feb '62)
"This Is FLOLS" (APPROACH Mar '62)

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Safety . . . a Religious Subject?

by LCDR Wayne N. Detrick, CHC

The Bible says, "Faith, Hope, and Love abide, these three; but the greatest of these is love." (Revised Standard Version 1 Cor. 13:13). The Bible does not say "Faith, Hope, and Safety—the greatest of these is safety." However, in the context of the word "love"—as used in the Bible—certainly safety is implied.

Recently, I had the privilege of participating in a ceremony in which one of our fine squadrons (HU-1) received a Chief of Naval Operations's Safety Award for the third consecutive year. My part was to offer the opening prayer. As I mused over the assignment, the thought occurred to me that in nonreligious terminology we substitute the words "SAFETY" for "love." We mean "love" but, in the man's world in which we find ourselves one does not use the word "love" in our relationship with one another. Oh, we allow the chaplain to speak of "brotherly love," but we want him to keep this in the confines of the chapel.

However, it seems to me that the parachute rigger who meticulously folds pleats and lines; the machinist who pays close attention to the tension readings on his torque wrench; the landing signalman carefully watching landing gear and weather conditions; or the pilot who safety-checks passengers, cargo and plane, is in a real sense expressing "love" for his fellow man. Each is deeply concerned for the men who look to him for their very lives.

Conversely, one might say, the man who has no love for his fellow man expresses his hatred (I choose a strong word) for others by the manner in which he handles details, either by neglect or indifference. His failure to accept responsibility in those matters may mean the difference between life or death, comfort or tension, loss or gain.

Dr. Ralph W. Sockman in "*The Higher Happiness*" relates an incident which occurred at the 1948 Olympic games. In a relay race, the French team had started well. But as the baton was being passed to one of the subsequent runners, he dropped it. The accident, of course, put the team out of the running. The runner at fault went into hysterics. Think of what this meant to the two runners who preceded him and whose work was ruined by his accident! And there was the runner who was to follow but never got the chance. And then, there were fifty million Frenchmen struck dumb by this blunder.

As I am writing this, Walter Shirra has landed in the Pacific within a matter of minutes from the deck of USS KEARSARGE. Six orbits, consuming less than ten hours flight time, taking him 162,000 miles and returning him *safely* to earth indicates to me that all the men and all the hours and all the check-off lists involved in the flight of S-7 had, as their basic foundation, a great love and respect for this man upon which we, as a nation, pinned our hopes. One announcer stated during the watching hours, "Millions of prayers are being offered for his (Shirra's) safe return." One man anywhere along the line of preparation who was not filled with brotherly concern for Walter Shirra, his wife and children, his parents, or our nation, could have "dropped the baton" by neglect, carelessness, or lack of responsibility and, in a very real sense, a low blow would have been struck not only at the Shirra family but at the free world from which it might have reeled in confusion for months, even years.

John Donne put the same thing poetically when he said, "Never send to know for whom the bell tolls . . . it tolls for thee." As indeed it does whenever we fail to practice that rule on which all programs of *safety/love* are built: "Do unto other as you would have them do unto you." Our lack of concern for any of our fellow creatures places him in a most dangerous position, and when he is in danger, we are in danger too.

Thus, you see, we are so related to each other that to practice "pure religion undefiled" one will apply and practice rules of safety. One cannot be a man of God and careless at the same time. ●

aaaaaAAACHOO! Whuzzamatter?

JUST a Cold

"Just a cold" spells aching miseries in anybody's language. But where other folks can doctor themselves with any one or all of the pills, capsules, gargles and sprays on TV last week and can corner the kleenex market until the whole thing blows over, matters are not so simple for pilots and aircrewmen.

Where an airman is concerned, a cold is not just a cold. It is something that can interfere with his ability to perform his job and, as such, it can be a threat to his safety and the safety of his aircraft.

Aside from the hazards of self-medication which we will discuss later, a cold can have two effects at altitude:

- A cold can close up your ear ducts or Eustachian tubes and make it impossible for you to clear your ears. This in turn can lead to considerable pain, inflammation of the middle ear and in rare cases, inflight rupture of the ear drum. It can also cause vertigo.
- A cold increases the possibility of an incapacitating sinus block in flight.

Structure of the Normal Ear

Colds cause ear trouble because of the way the ear is put together.

The ear is an air-filled, closed cavity with pressure equalization possible only when the Eustachian tube connecting the middle ear and throat is opened. (See Fig. 1.) The Eustachian tube narrows where it joins the throat. This narrowing operates in much the same manner as a flutter or flapper valve. It lets air out of the middle ear more easily than it lets air in. (See Fig. 2.)

During ascent, the air in your middle ear expands as external atmospheric pressure decreases. Under normal conditions, excess air passes out through your Eustachian tubes without difficulty. When this happens you may hear a snapping noise in your ear or feel as if bubbles are moving through the tube.

When external atmospheric pressure increases during descent, narrowing of the Eustachian tube acting as a flutter valve prevents entry of air. You can usually equalize the pressure in your middle ear by yawning, by swallowing or by yelling. These actions contract the muscles which open your Eustachian tubes and allow air to rush into your middle ear.

The Cold-Affected Ear

But what happens when your Eustachian tubes are swollen because of a cold, sinus trouble or even an allergy and you are unable to clear your ears?

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THE EAR—in cross-section

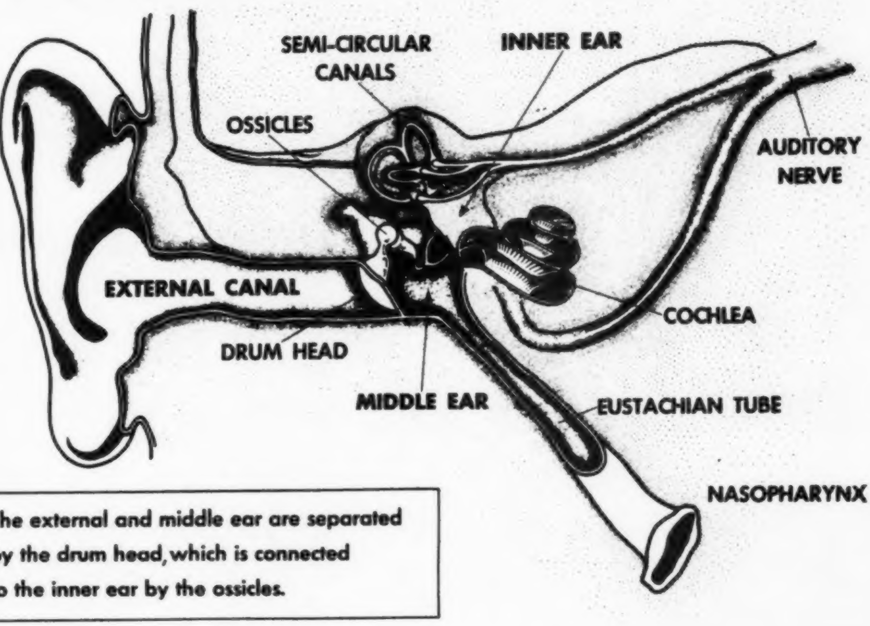


FIG. 1

The external and middle ear are separated by the drum head, which is connected to the inner ear by the ossicles.

a feature of the MIDDLE EAR

THE "PRESSURE RELIEF VALVE"

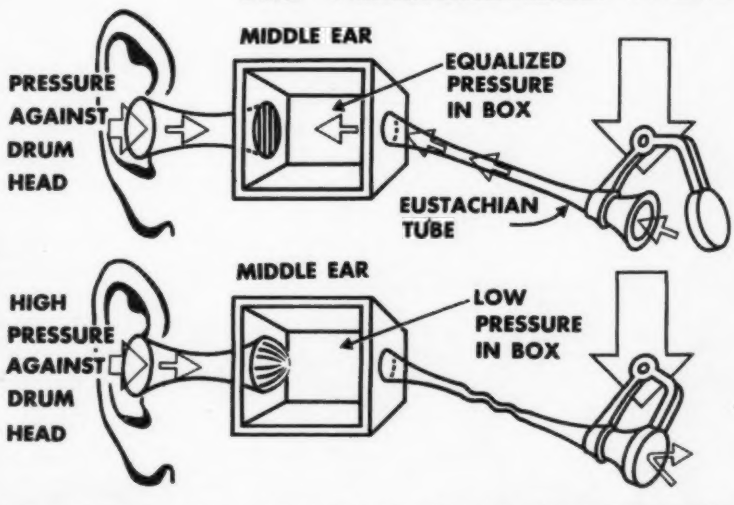


FIG. 2

When your Eustachian Tubes, acting as "Valves," are o.k. and you descend, the "Valves" open, (when you clear your ears) and admit equalizing pressure.

If you have a cold and the tube and valve are swollen; the pressure against your drum head cannot be equalized.

IF YOU HAVE A COLD—HAVE YOUR VALVES (EUSTACHIANS) CHECKED

During ascent you become aware of positive pressures in the middle ear as a feeling of fullness. As pressure in the ear increases, discomfort increases and there may be a steady hissing or roaring noise or a crackling and snapping. Occasionally there may be actual pain and mild vertigo. However, air usually vents off through the Eustachian tube even though the tube is swollen.

During descent when your Eustachian tubes are swollen and you are unable to clear your ears, negative pressure builds up in the middle ear. As pressure differentials increase, ringing becomes marked and there is usually dizziness with nausea. Pain is very severe and radiates out from the ear. Deafness is marked and dizziness and ringing usually increase though the latter may disappear.

Increasing differential pressure can result in rupture of the eardrum—an experience which has been compared to being hit on the side of the head with a plank. A loud explosion is both felt and heard in the affected ear; there is a sharp, piercing pain on the affected side; dizziness and nausea become marked; and collapse or generalized shock may follow. When the eardrum ruptures, hearing is diminished. Acute pain subsides, but a dull ache persists from 12 to 48 hours.

Sinus Blockage

The necessity for equalizing air pressure also exists in the sinuses and blockage by the effects of a cold or an allergy produces similar problems. If sinus openings are obstructed by swelling of the mucous membrane lining, pressure equalization becomes impossible. Resulting pain can be slight or it can be unbearable.

Unlike the ears, the sinuses are affected by ascent and descent almost equally. Depending on which sinuses are involved, pain can extend over the forehead above the bridge of the nose, on either side of the nose in the cheekbones or even in the upper jaw teeth. Though the pain is similar to that caused by ordinary sinusitis on the ground, it can be much more severe when sinus blockage is sudden during rapid change in altitude.

Self-Medication

When tempted to "doctor" your cold or sinus trouble and then fly, our advice to you is "Don't." Ordinary remedies can produce effects which can be dangerous to a pilot or crewman at altitude. (An allied problem in aviation is the possibility or errors of omission or commission by support personnel who are sick but are taking all kinds of cold remedies and are still on the job.)

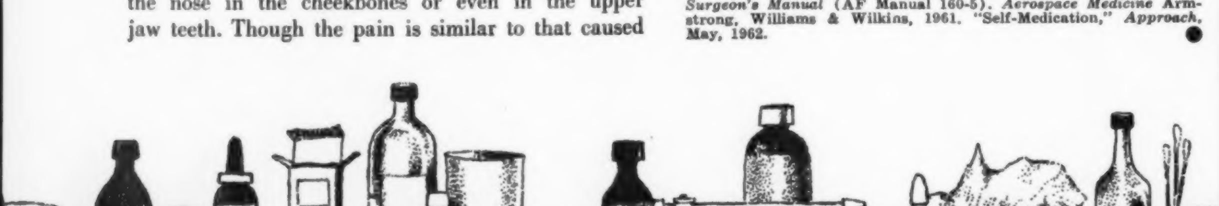
Antihistamines, for instance, which are contained in tablets, capsules and even in some cough medicines, are particularly dangerous to flying personnel. Response to an average dose of an antihistaminic drug can vary from no effect at all to marked drowsiness, reduced alertness and even mental depression. Antihistamines can adversely affect depth perception and equilibrium and can reduce perceptual motor skills such as eye-hand coordination.

Cold compounds which contain quinine can produce ringing of the ears and dizziness. Certain nose drops contain drugs which primarily constrict the blood vessels within the nose, increase blood pressure and pulse rate and even cause the "jitters." Some nose drops can produce incoordination and visual disturbances. Sulfa drugs and analgesics or pain killers such as aspirin are thought by some persons to lower resistance to hypoxia.

Though colds can plague us at any time of the year, we are now at the height of the "cold season." Don't take your colds to the drug store pharmacist and don't take your colds to altitude—take them to your squadron flight surgeon. A few days on the deck to cure a cold is better than being grounded for weeks because of post-flight complications.

References:

Aviation Medicine Practice (NavPers 10839-A). *USAF Flight Surgeon's Manual* (AF Manual 160-5). *Aerospace Medicine* Armstrong, Williams & Wilkins, 1961. "Self-Medication," *Approach*, May, 1962.



Keep that Hard Hat

Item: AFTER an HUS 1 lost power and autorotated into the water, all three crewmembers escaped uninjured.

On surfacing the pilot attempted to inflate his life vest. Pulling the right toggle failed to actuate the CO_2 cartridge. He was unable to locate the left toggle which had been secured inside the cover flap of the CO_2 actuator housing cover. Unsnapping the cover, he released and actuated the toggle. There was a hissing noise of escaping CO_2. The vest failed to inflate.

The pilot used his and the crew chief's hard hats for flotation by placing his arms through the chin straps and inverting the helmets. The three men were rescued by SAR helicopter.

Examination of the pilot's life vest showed that both screwdown cartridge container cap covers were loose. The pilot stated that he had not preflighted his life vest. After the cap cover was tightened, the right CO_2 cartridge was actuated and the vest inflated successfully. Following replacement with a fresh CO_2 cartridge on the left side and tightening the cap cover, actuation of the cartridge and inflation of the vest occurred as expected.

Preflight your personal equipment as you would your aircraft.

Item: A pilot was taxiing an OE-1 from the compass rose to the squadron's line, a distance of about one mile. When the right brake assembly become hot, he shut down and debarked from the aircraft. When almost clear of the aircraft he slipped and fell. His APH-5 helmet struck the horizontal stabilizer with force sufficient to cause damage to the outboard two feet of the elevator. He was uninjured.

Item: After ejection and parachute descent, an F8U pilot landed in a wooded swampy area. His feet hit a large tree about 10′ above the ground, then his head struck the trunk with great force.

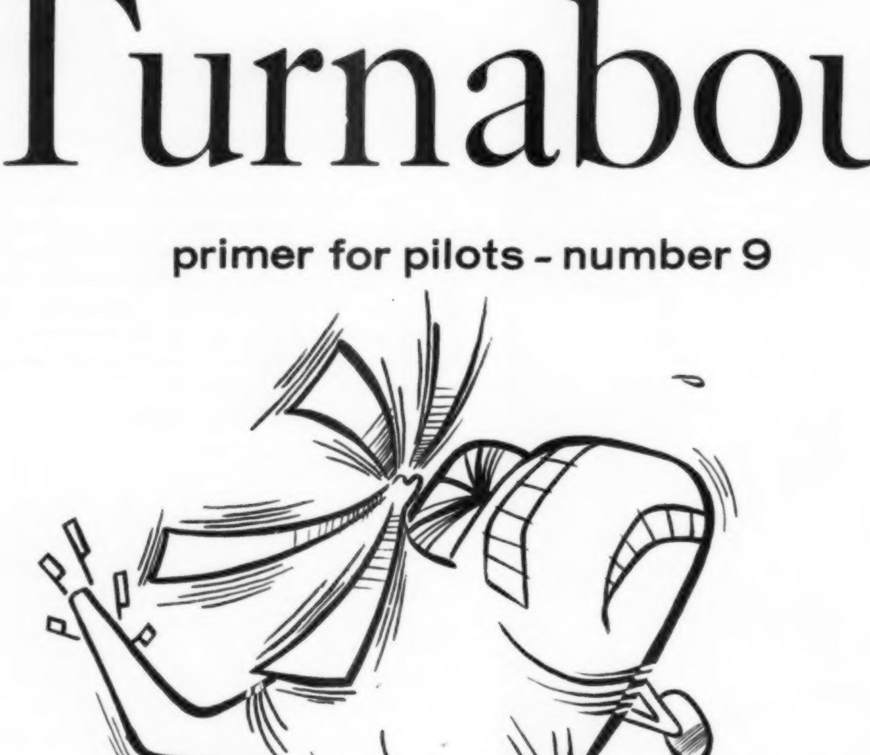
"It was a good thing I had cinched up my helmet during parachute descent," he later stated. "Otherwise that knock on the head by the tree would have probably killed me."

Item: The aircrewman's S/PH-1 helmet served as good protection when he was being hauled up the Jacob's ladder. The ship was rolling to such a degree that he hit his head against the side several times.

Item: As the rescue destroyer slowly approached the survivors of an HSS accident, crewmembers lining the forward port rail threw out life preservers. One of the preservers struck the pilot on the head. He believes the blow might have injured him had he not retained his hard hat. ●

Turnabout

primer for pilots - number 9



Helicopter pilots may be as lucky in love as fighter and attack pilots, but since these are nonreportable statistics under the provisions of the current OpNav 3750, fixed wing pilots wanting to have some fun with the rotating types are advised as follows—just ask them the important numbers associated with varying bank angles.

by Major H.G.C. Henneberger

Fixed wing pilots are all too familiar with the theory that as bank angle increases there is a corresponding increase in stalling speed. Since helicopters don't have the same stall characteristics as fixed wing aircraft it is doubtful that helicopter people are as familiar with the theory as their fixed wing brethren.

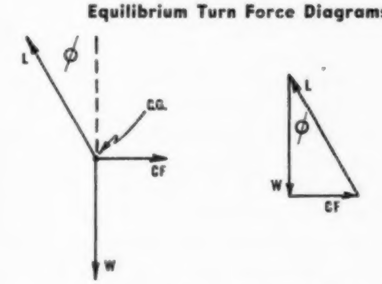
Load factor or "G", however, increases with bank

angle in a helicopter in exactly the same way it does for any other aircraft. Correspondingly, the power required to hold airspeed in the bank without losing altitude increases. If the pilot doesn't come in with that extra power at the precise moment it is needed he further complicates the power problem and he either begins to settle or lose airspeed. If he holds airspeed he will settle, if he holds altitude he will lose airspeed. If he is heavily loaded he may not have the extra power to spare and if he is close to the deck he will undoubtedly succumb to the urge to come in with collective. The story from here on is all too familiar to helicopter pilots—another loss-of-turns accident.

Helicopter pilots should be just as familiar with the important numbers associated with bank angles in their particular machine as fixed wing pilots are. Ask any jet driver what percent increase in stall speed is generated in a clean 30-degree bank over the break in his bird and he can probably tell you. But ask the average helicopter pilot what percent increase in apparent gross weight is generated in a 30-degree bank for his bird and the odds are that he can't tell you.

The load factor and hence apparent gross weight increase in banks up to 30 degrees is relatively small. But even so, under the right set of adverse circumstances such as high density altitude, gusty air, poor pilot technique and high gross weight, a power deficit could easily be induced. Above 30 degrees of bank the apparent increase in gross weight soars. At 30 degrees of bank the apparent increase is only 16% but at 60 degrees it is 100%. We all know that the bank limitation on most helicopters is 30 degrees, but we know too that helicopter people are famous for ignoring this limitation. Perhaps if they were familiar with the numbers involved they would have more respect for the limitation.

Equilibrium Turn Force Diagrams



Load Factor $= L/W = 1/\cos\phi$: for $\phi = 30°$ $\cos\phi = 0.866$: LF $= 1.16$

Load factor developed in a turn could be limited by the following:

a. Limit load factor of structure.
b. Power available to maintain altitude and airspeed.
c. Blade stall.

At lower left is a rough load factor breakdown on some of our fleet helicopters at various angles of bank. Included is the apparent weight increase over a given gross weight in straight and level flight.

Apparent Weight Increase Over Initial Gross

Bank	Load Factor	HUS*	HUP*	HOK*	HRS*	% Increase
10°	1.02	226	106	118	150	2%
20°	1.06	678	318	354	450	6%
30°	1.16	1808	850	945	1200	16%
40°	1.3	3390	1600	1770	2250	30%
45°	1.42	4750	2225	2470	3150	42%
50°	1.55	6200	2900	3250	4100	55%
55°	1.74	8370	3900	4370	5500	74%
60°	2.00	11,300	5300	5900	7500	100%

H-34 (HUS) loaded initially to 11,300 lbs
UH-25 (HUP) loaded initially to 5800 lbs.
OH-43D (HOK) loaded initially to 5900 lbs.
CH-19E (HRS) loaded initially to 7500 lbs.

There are other problems associated with the mechanics of the banked turn in helicopters such as retreating blade stall and structural stress at high gross weights. The most pressing problem from the accident prevention point of view is power management. We have a good idea of how many helicopter power management accidents there have been. What we don't know is, how many of our tired old birds have had their guts nearly pulled out when the pilot induced a power deficit in a low speed steep bank and was lucky enough to get away with it. We can't help but wonder how many of these same birds were later involved in engine failure accidents. ●

MIDAIRS

There are all sorts of ways to bang up an airplane around an airfield—wheels-up, landing short or long. . . . However, the greatest potential for death and destruction is the midair collision in the traffic pattern and that situation is aggravated where aircraft at the same field are operating under different frequencies—some on tower and some on GCA or MLP.

There are four in that split-communication category:

• Fall 1961

One A-3 (A3D) was in right-hand MLP pattern to the runway. Another A-3 was on straight-in GCA to the same runway. Midair collision occurred $2\frac{1}{2}$ miles on final. Six dead, two A-3s destroyed.

• Winter 1961

C-47 (R4D) was making GCA to runway 8. S-2 (S2F) was making left-hand VFR approach to runway 4. Tower told S-2 to make immediate right turn but no traffic advisory about C-47 issued. Right turn not started and sudden sight of C-47 apparently startled S-2 pilot who stalled, spun to right. Two dead, one S-2 destroyed.

• Mid-summer 1962

Two F-9s (F9F) executing simulated precautionary approach under tower control. C-119 making go-around from GCA was downwind under RATTC control. Tower did not inform F-9s of C-119. RATTC did not inform C-119 of F-9s. One F-9 struck C-119. Both aircraft damaged but landed safely.

• Summer 1962

TF-9J (F9F-8T) was making GCA. Small trainer was making touch-and-go. No traffic advisory issued to pilot of either aircraft. TF-9J collided with trainer on upwind end of runway 350 feet above the ground. One dead, both aircraft destroyed.

This list might have been longer except for the element often called "luck" and we are able to call them "near-misses." Some seven incidents of this nature have been officially reported in the past several years.

• Spring 1960

F-9 called tower from 4 miles out. Pilot saw two A-4s level and closing, rolled and dived to avoid. Upon inquiry tower advised they were radar traffic.

• Summer 1960

S-2 on GCA final in clouds at 800 feet. TC-45 (SNB) below clouds maintaining VFR under tower control. Near-miss as S-2 broke out of clouds. Weather in approach zone lower than at field.

in the traffic pattern

• Winter 1961

Civil Constellation (C-121) making night ASR told to break off at 4 miles and contact tower and make circling approach to runway 10. C-121 failed to break left or contact tower. S-2 (S2F) had been cleared by tower to break at upwind end of runway 10. C-121 passed under S-2 in head-on pass.

• Winter 1961

C-54 (R5D) maneuvering to land on runway 31 following actual IFR approach. Tower cleared EC-121 (WV-2) for takeoff on runway 9. Near miss at extremely low altitude.

• Winter 1962

P-2 (P2V) on GCA and cleared to land. Nearing touchdown when GCA gave waveoff. Tower had cleared an A-1 (AD) for takeoff and instructed him to switch to departure frequency. Near-miss over field in instrument conditions.

• Spring 1962

E-1 (WF-2) under GCA on 2-mile final. P-2 (P2V) on tower frequency maneuvering to land after GCA. Near-miss at 500 feet altitude.

• Spring 1962

H-34 (HUS) making night practice GCA. On short final, GCA advised H-34 of S-2 (S2F) in pattern; S-2 was actually on final. Seconds after traffic advisory, helo plane commander took controls and executed abrupt right turn to avoid the overtaking S-2.

Obviously, these are not the only near-misses which have taken place. Conversation with nearly any aviator can bring out a case which happened to him personally. The situation is serious enough to prompt CNO to recently order all Naval Air Stations and Air Facilities to "objectively review the coordination procedures and practices between RATTC, GCA units, LSO and towers for adequate communication links, appropriate instructions and ATC personnel training programs."

The air operations system we now have is a good one. It works. Listening to an explanation of what equipment is used and how the tower and GCA/RATTC coordinate airspace in the traffic pattern, the possibilities of a mid-air sound so remote as to be compared to the chance of winning all the silver dollars in Nevada. How then, does a midair or near-miss come to be?

Lest we be too quick to condemn tower operators (they are in the minority and could be outvoted by pilots) let's make sure that the pilot is aware of his own area of responsibility. Here is an unofficial report on a pilot who failed to heed his clearance and endangered the lives of five people in two aircraft, plus about two million dollars worth of airplane.

A jet was on a GCA to a full stop. The radar coordinator had requested a full stop landing from the local controller in the tower when the jet reached three miles from the end of the runway. At this time, a prop aircraft had just been cleared for takeoff by the local controller. He cleared the jet to land full stop. The prop aircraft delayed takeoff for about one minute due to radio difficulty then began rolling with the jet approximately one mile from touchdown.

Since the prop would be airborne quickly and the jet would be slowing after touchdown, the local controller was not overly concerned about the close proximity of aircraft. However, the jet pilot decided to make a touch-and-go instead of a full stop. Following his "crash and dash" he turned his attention to getting tower frequency for landing and failed to note his jet rapidly overtaking the prop aircraft ahead. According to the prop pilot, the jet swooshed by with less than 30 feet clearance.

Such a small thing, deciding to make a touch-and-go instead of the expected full stop, at least it seemed small from the pilot's point of view. Suppose though, the ending had been different. That small decision would have loomed large in an accident investigation. We would have read transcripts of the GCA and tower tapes plus statements of witnesses and participants.

Fortunately, an accident did not take place. But if it had, we can predict with reasonable certainty that the accident board would pay particular attention to what was said to each of the pilots by their respective controllers and what was said between the air-controlmen coordinating the two aircraft.

Several questions would be asked: Did either pilot receive information about the other aircraft? Did the tower originally pass "traffic information" to GCA and revise it when the takeoff delay appeared? Was there an attempt to warn the prop pilot or to use Guard channel to alert the jet pilot once the situation developed?

How can we be sure an investigation would follow these lines? *Because it went that way in all four of the accidents previously mentioned.* And what did investigators find in those accidents? The most common element was an absence of timely advisories to the pilots concerning conflicting traffic. This fact applies to the near-misses as well.

Was absence of traffic advisories significant? The individual accident boards thought so. In each of the accidents there were recommendations to increase

this service. One recommendation, which may be taken as representing the feeling of the others, said: "Reemphasize to tower personnel the necessity of informing pilots in the landing pattern as to the position of conflicting traffic. Any error in the passing of information to the pilot should be on the side of too much rather than too little."

Are traffic advisories an actual part of the aircontrolman's duties? Yes, they are. The Air Traffic Procedures manual, ATP 7110.1A, is used by both military and civil controllers and section 411.1 of that manual gives the basic authority for the issuance of such advisories.

As a general rule, civil towers are more likely to issue advisories than are Navy towers.

Now, before you Air Controlmen start sending bombs to APPROACH under separate cover of night, consider the experience of one pilot. While it may not represent *your* cab, it illustrates a trend which appears to be widespread.

This pilot was at the 180 and reported the usual "gear down and locked." The tower operator responded with the usual "cleared to land, recheck gear down and locked." Shortly thereafter, on base leg, the pilot glimpsed a multi-engine prop aircraft apparently making a long straight-in to the same runway. When the pilot inquired about this strange traffic, the tower operator replied, "He's on a practice GCA, continue your approach."

traffic pattern

Following several midair collisions in the traffic pattern, the commands concerned came to the painful conclusion that deficiencies may have existed in air traffic procedures for their fields. In general these apparent deficiencies concerned landing priorities or restrictions on various types of traffic using the same field.

First-come, first-served has a long tradition of use and this may be why the subject of landing priorities is a distasteful one to practically everybody in the cockpit. Whenever a field establishes priorities or restrictions a tug of war surges under the surface: Tailhookers about to deploy feel MLP is the most important thing, people working on radar approaches dispute this strongly as do those arriving on flight plans with a low code aboard.

Actually, it's difficult to decide which type of operation is most important or least important. But if it must be decided, air station personnel responsible for air traffic usually get caught in the middle. So the subject becomes distasteful to them also.

Some decisions which station personnel have had to make are:

- Shall practice radar approaches be made to an off-duty runway where a crossing situation with normal traffic will exist? If so, are minimum altitudes and waveoff distances/directions clearly indicated?
- When practice radar approaches and MLP are being made to the same runway, who has priority?
- Is a "low pass" or "low approach" following a radar approach clearly defined and understood by GCA and tower personnel? Unless acknowledged by the pilot, a clearance to cross the field not below a specified altitude (400, 500, . . .) may be confused with the altitude used for radar minimums.
- What weather minimums are set for MLP? In various Airfield Operations Manuals the ceilings range from 600 to 1200 feet; visibilities appear standardized at 2 miles.
- Are weather minimums set for practice radar approaches? (One field sets 2000/4 or better as required for practice radar runs).
- When MLP is in progress and the tower has landing VFR traffic to the same runway, which aircraft has priority?
- Does the LSO have a defined point in the pattern (the 180, the 90, etc.) at which he must waveoff or extend MLP traffic if a conflict with other landing traffic occurs or could occur?

If these questions appear academic or theoretical read the following near-miss report and imagine it resulted in an accident. These type questions would

Well, now. That's nice to know. Would it have been nicer to be alerted to another aircraft when the landing clearance came through? Plus a sequence for landing?

Pilots trust the tower. If no other traffic is *reported* there is a tendency to assume none exists. However wrong this mental relaxation may be, it happens. And it is disconcerting to catch sight of an aircraft you were not expecting.

Of course, there is another side to this story. When we consider non-receipt of a traffic advisory we must also consider the amounts of energy and attention and air time going into tower phraseology regarding wheels-up prevention, noise abatement, obstructions and construction.

Are we swatting flies with a baseball bat while forgetting the primary purpose of the tower is "traffic control?"

Airplanes must continue to operate in the traffic pattern while tuned to different frequencies—so how do we go about eliminating future incidents or accidents?

If a small recommendation were to be attempted from this viewpoint, it might be capsuled: "less chatter, more controlling." Shift the voice communication emphasis to the subject of traffic advisories, both to the pilot on GCA and to the pilot on tower/MLP frequency.

DOCTRINE?

then become very real—the biggest being "What could be done to *prevent* a repetition?"

"I entered the landing pattern," said the pilot of a P-2, "at approximately 0910. After two full stop landings, several F-8s taxied out for field mirror landing practice. On the third landing there was no interference noted.

"After the succeeding takeoff, the tower advised me to fly the downwind leg at 1500 feet instead of the usual 1000 feet. When ready to turn base I called the tower which directed me to extend downwind and take interval on the F-8 at the 180 degree position. However, no F-8 was visible at the 180 position but one was in sight at the 90-degree position.

"The tower replied, 'F-8 behind you. Continue.' When at the 90-degree position I reported that the F-8 was still not in sight and received the same response as before. Then I received the word 'cleared to land.'

"While rolling the P-2 out on final approach (about 400 feet above the ground) an F-8 in a port turn passed approximately 125 feet below me and 50 feet to port. He proceeded down the runway, executing a waveoff.

"The F-8s were switching to LSO frequency prior to their takeoff; consequently I heard no instructions transmitted to the F-8 which passed below me."

Obviously, there isn't enough information in this one-sided report to make an accurate assessment of the incident but it may be useful for drill purposes.

Was anybody at fault? Probably the major item was the tower operator's inadequate instruction to the P-2 pilot—for him to take interval on an aircraft which was not visible from the P-2 cockpit. Perhaps the P-2 pilot was too insistent on his right to land when the situation became confused as to where his traffic was. Or the LSO could have let the conflict develop to the point where a late waveoff by the F-8 did nothing to improve the closing situation. The F-8 was the burdened aircraft since it was an overtaking case—however, the F-8 was at a lower altitude which sea lawyers can say gave the jet priority to land.

No matter how you look at it, an accident probably would have resulted in recommendations to restrict activities or set up priorities as well as put the LSO and tower on their toes a little tighter. However, locking the barn after the horse is gone does nothing to bring the horse back. Is it better to develop self-imposed restrictions or wait until they are forced on us? With so many varieties of aircraft and missions competing for runway space can we afford not to? ●

Night Angel

A ComOpDevFor project to develop techniques for helicopter night plane guard and rescue has been completed by VX-1 at Key West. A report on the project will be forwarded to all interested parties.

The following is a discussion of the problem by LT Paul Frankenberger who recently made a successful helicopter night rescue at sea while operating from a carrier:

At the time I "experimented" with this night rescue and plane guard work I was attached to HS-3 and flying the SH-3A (HSS-2).

The need for night rescue techniques became obvious to us almost as soon as we went to sea, operationally, with the SH-3A. However, it was forcefully sent home when an actual night rescue of an AD pilot was made while at sea in June of this year. I was rather fortunate in being connected with this successful rescue mission and was able to press for further work along this line as a result.

I obtained permission from my Squadron Commander and the Air Group Commander to work with some ideas we had for night plane guard.

After experimenting during daylight hours first we finally had it set up for a "go at it" at night.

We were the first helicopter in the night marshal stack. After the carrier had turned to its final recovery course, we commenced our approach. The approach was the normal Tacan/Radar approach up to one-half mile or when we sighted the carrier whichever was first. At this point we set in a bearing on our ID-249 that was 135° relative to the ship's recovery course. We then moved out slightly to starboard (about 100-200 yards right of the wake) and when the bearing indicator needle began to center we commenced our automatic approach.

Our setup for this is 150 feet and 60 knots ground speed. We set in the ship's recovery speed on the

control panel and 80 feet as our base altitude. The approach was commenced by engaging the automatic approach button. The aircraft descended to 80 feet and 20 knots ground speed (this was the ship's recovery speed). Our distance from the ship as indicated on Tacan was ½ to 1 mile and we moved ourselves up to our bearing very easily. Comments from the ship were that this was a good position. So we hovered there maintaining our Tacan position as necessary with the speed and drift knobs on the hover control panel. The copilot did this very easily on command from the pilot. The pilot stayed on gages while the copilot watched the recovery. We were in good position to watch launches and recoveries and I suggest that this be given thought to aid the pilot in just having to keep one position. The pilot can go to any area around the carrier very easily from this position.

Our lights were on bright and our rotating beacons ON, at the request of the fixed wing pilots. So apparently there was no bother with this.

After the recovery was complete we broke dip in our normal manner, as we would have in any night ASW hover, and proceeded ahead until it was safe and comfortable to turn downwind. At this time a right turn, standard rate, to the reciprocal of the recovery course is made. Climb to 600′ (or whatever it is to intercept the mirror) and on signal from CCA commence a half standard rate turn to final course, lowering the landing gear and setting the lights as necessary. Then a normal approach is made getting the meatball at the normal distance.

That is basically the idea of the night plane guard. It makes full use of the automatic approach, speed and altitude controls of the helicopter thus easing the task of the pilot. However, we felt that the pilot should stay on the gages and the copilot observe the recovery. It was very comfortable and entirely feasible. The helicopter can vector easier to a crash site than a destroyer can and can do it faster. Also, this could possibly release a destroyer for duty in the screen or other tactics.

We experimented also with an approach to a downed pilot. In this we felt that the actual location of the downed pilot was about 75% of the problem. However, once finding him we could, in the SH-3A, mark and memorize his position very easily on the navigator in the plane. Then turning downwind as we pass over the downed pilot do a 90°-270°, or standard rate turn, into the wind as necessary. After going downwind a sufficient time to cover the automatic approach turn into the wind and be lined up with the pilot according to the navigator readout, then commence the automatic approach. Plan to come to a hover just short of the downed pilot and then making use of lights to sight the pilot and the speed set knob move up over the pilot and effect the rescue.

I feel that full use of all the automatic features should be made to facilitate the pilot's job and also to make a safer more stable hover at night.

I do wish to emphasize that full use of any automatic features in the helicopter should be utilized. Also, these approaches and plane guard positions should be practiced until they become second nature to the pilot. I realize that all this work was done with the SH-3A and the features and equipments in the plane make any task an easy one and a delight to perform. ●

Age quod agis

THIS narrative is so disgraceful, so unnecessary and avoidable, but so typical of what can happen, even to a Safety Officer, if he is sufficiently preoccupied and inattentive, that I'm passing it along.

The leader of a flight of four A-1H6s (AD-6) taxied clear of the line, and pulled up on the ramp to await his delinquent wingmen. One informed him during briefing that he would be (legitimately) delayed. The second had starting troubles, and the third was constitutionally given to a leisurely preparation for flight. As a matter of fact, he briefed in uniform to avoid the rush and jostle of donning flight gear.

After some 15 minutes, the starting discrepancy was overcome, and as the leader saw one or more A-IH straggle out of the line, he gunned his aircraft around, heading for the taxiway he had been watching. Along this taxiway several jets had been moving as though returning to their line after landing on the runway paralleled by the taxiway. These moving aircraft and the wind direction, almost down the same runway, led this hapless leader into the conclusion that this, in fact, was the duty.

He taxied briskly along, incidentally calling Ground Control for taxi clearance, and receiving from that agency the duty runway, time and altimeter setting with his clearance. The words of the ground controller fell on ears deafened by preoccupation with the minutes creeping by the scheduled takeoff time, ways and means to shorten some parts of the hop, and malice toward the procrastinating wingmen. The trained mind automatically reconciled whatever it was Ground Control said with the decision already made in the matter of duty runways. But here that old confidence played this division leader false. This failure to double-check opinions, no matter how often vindicated, with the facts, might have led to very serious consequences.

Fortunately the jet on final had already taken a safe but justifiably enraged waveoff because of the *Spad* which briskly taxied *across the true duty runway* at the upwind end. About that time the brooding flight leader realized his grievous error, and crept shamefully back, frequently and humbly requesting the approval of a cold and supercilious Ground Controller. This leader learned to his chagrin that no matter how experienced a pilot is, nor how obvious a decision of this type might seem, that when one is operating an aircraft, one does not have time for righteous reflections and planning timing which does not pertain to the operation in progress.

One must listen carefully and watch diligently, and as the Latins say "*Age quod agis*", "do what you're doing."

ANYMOUSE

Unguided Missiles

I WAS recently riding an R4Y aircraft carrying both passengers and cargo. Among the cargo were tool boxes secured with nylon cargo straps. After touching down, the props were placed in reverse pitch and hard braking was initiated. At this time the tool boxes slid out from under the securing straps and came flying forward along the flight deck. If a wheels-up landing had been made, I feel sure all the cargo would have come flying forward.

The R4Y has areas with net fronts for storing just such cargo. There is no excuse for this type incident. Laxness on the part of crewmembers in securing cargo and plane commanders in inspecting secured cargo could lead to much more serious consequences.

Night Light?

IT was a beautiful night. The stars were bright and a field-grade moon was as pretty as a silver dollar in the sky.

Like all hot pilots fresh out of the training command, I was anxious to launch on my second night fam in a *Crusader*. With afterburners blazing, the RAG instructor and I blasted off into the night. The hop was routine and went as briefed—Well, almost as briefed. We returned to base VFR and broke for individual touch-and-go landings. After several landings I was feeling pretty good about how well I could handle the bird. After calling the 180 and being cleared for another touch-and-go the tower frequency became cluttered with some chatter which I wasn't paying much attention to.

After the landing I was about to call for downwind when the tower finally ascertained that an Air Force T-33 was entering the break with no navigation lights and an intermittent radio. I was instructed to maintain my altitude so the T-33 could break overhead. I immediately pulled off the climbing power and began to scan up and aft, looking for the guy. I must have begun easing in backstick too because seconds later the aircraft buffeted and one wing dropped.

After adding 100% my eyes were glued on the instruments: 200'/min sink rate and the altimeter unwinding. I held what I had for what seemed like an eternity. My bird quit settling at 500' indicated (field elevation—477') with 110 knots and 19 or 20 units angle of attack ($13\frac{1}{2}$ units is optimum).

To this day I don't know whether I went over or under a power line which is one mile or so off the end of the runway. The tower said "Four-zero-five, are you experiencing any difficulty?" *Silence*—I wasn't able to answer until arriving at the 180 again when I called for a full stop.

I learned from this experience that night work is basically instrument work and that in a tight situation I'll never hesitate to use afterburner when it is needed.

Big Foot

DROPPED passenger at the scheduled stop at NAS enroute in my *Sneeb*. Scheduled copilot unavailable, but a passenger was there for NAS home—a PO1 aircrewman with many flight hours including Beech observer time. CAVU weather entire route, so took the PO1 as observer and departed. Being bighearted and normally gregarious, put PO1 in right seat. Trip uneventful. Had thoroughly briefed him on emergency procedures and to keep from touching any knob, switch, lever, etc. He was a large man and filled the seat to overflowing.

After landing at destination, taxied to line. Upon entering the line, before getting to the pack, the *Sneeb* started drifting left, right brake and, as the left turn became more pronounced, left engine, had no effect. Since my taxi speed was slow I took all power off and the left turn was stopped after 270 degrees. A fast taxi speed would have given a groundloop for sure. No malfunction of any system could be seen until I noticed the large feet of the observer slap up against the brakes. Stretching, he had inadvertently actuated the left brake—when he saw the aircraft was not doing what I wanted, he'd frozen tight, remembering my instructions, so as not to interfere with my controls. Returned to line. Observers in the cabin from now on. ●

HEADMOUSE

Patrol Plane Hardhats

Dear Headmouse:

August issue had a reply to a letter about multi-engine hardhats stating APH-5 hardhats will be used for all aircraft.

Our squadron has been using a multi-engine hard hat, designated S/PH-1, and many of the pilots are quite pleased with it. Is the S/PH-1 no longer an acceptable protective device, as described in NATOPS, and if so what Instruction Number has cancelled or restricted its use?

JOHN T. STEELE, LT
ASO PATRON 17

▶For the latest word from BuWeps on evaluation of the multi-engine hardhat (the BPH-1 helmet) see the answer to LT R. J. Prosser's letter next on this page.

The NATOPS Manual outlines the requirement to wear a protective helmet. The Section "H" allowance list specifies the type of helmet to be worn. In accordance with the Section "H" Allowance List the S/PH-1 helmet is *not* authorized for your squadron.

Very resp'y,

Headmouse

Survival Equipment in P-3 (P3V) P-2 (P2V), and P-5 (P5M)

New requirements have been issued by CNO for wearing parachute harnesses, life jackets and helmets in P-3 (P3V), P-2 (P2V) and P-5 (P5M) aircraft. The following is taken from CNO's letter of 1 Nov 62:

Parachute Harnesses:

1. To be worn by the pilot and copilot at all times during flight in P-2, P-5 and P-3 aircraft.

2. To be worn during flight or prefitted and stowed in a readily accessible predesignated standard location by all other crew members and passengers of P-2, P-5 and P-3 aircraft. Parachute harnesses are required to be worn by all occupants of P-5 aircraft during overland flight operations.

Life Jackets:

1. To be worn by the pilot and copilot at all times during overwater flight operations in all three types of aircraft.

2. To be worn by all other occupants during overwater takeoffs and landings and during other overwater flight operations below 1000 feet. To be worn or stowed in a predesignated standard stowage space during other overwater flights. This policy is applicable to all three types of aircraft.

Protective Helmets:

1. To be worn by all aircraft occupants during takeoff and landing in P-2, P-5 and P-3 aircraft and to be worn or accessibly stowed in a predesignated standard stowage space during other flight operations.

Dear Headmouse:

While browsing through the Aug. '62 APPROACH I noted a letter and reply concerning hardhats for us twin fan types.

With all due respect for the APH-5 (I have one and used it in patrol aircraft for over a year) I think the wrong people were in on the evaluation of the multi-engine hardhat. I am one of the fortunate few in this area to own and use the experimental DH-51-4 (BPH-1) patrol hardhat. In two years of constant use (over 70 hours a month yet) I have found it far superior to the APH-5. While not much lighter, it is cooler, more comfortable (my APH-5 is properly fitted) and allows for much easier communications between pilots and crewmen with or without the aid of an ICS.

In this area of the world where a 12-hour hop at low altitude with ambient air temperature as high as 100°F. is the normal, an APH-5 is next to impossible without a built-in air conditioner. The DH-51-4 is used and sworn to by those fortunate few who have them, and in most cases it is used for the entire flight, regardless of length.

I, for one, would be all in favor of a re-evaluation of the patrol hardhat, preferably by the people who will have to use it, and in the area where it will be used (all of them). If the APH-5 edict is to be enforced, I fear that we patrol types will continue to have problems in non-compliance with directives concerning the use of hardhats in the multi-engine patrol aircraft. And this, needless to say, constitutes a safety hazard for those concerned.

R. J. PROSSER, LT
ASO, VP-40

Have you a question? Send it to Headmouse, U.S. Naval Aviation Safety Center, Norfolk 11, Virginia. He'll do his best to help.

▶ Because of your letter and similar inquiries, the NASC queried BuWeps on the status of the protective helmet for patrol plane crewmen. The following answer was received:

"As a result of Fleet comments concerning the evaluation of the BPH-1 helmet, this Bureau deferred additional procurement until such time as remedial action could be taken to correct the discrepancies noted. These discrepancies involved comfort, sound attenuation, earphone mounting, retention and webbing attachment and adjustment.

"Design modifications are being made to correct the above discrepancies and a quantity for flight evaluation will be procured shortly. On completion of successful flight evaluation at the Naval Air Test Center, revised design data will be furnished to the Aviation Supply Office for procurement of helmets for fleet use."

Very resp'y,

Headmouse

Privileged Info

Dear Headmouse,

ComCruDesLant Inst 3505.4 requires the commanding officers of destroyers, "forward to ComCruDesLant a copy of any aircraft accident report statements submitted by ship's personnel."

This seems a violation of the principle that AAR statements are for the use of the accident board only, and it seems that it might have an influence on what statement the ship's personnel makes.

I feel that the destroyer force has a necessity to know this information but it should not be a *copy* of the AAR statement.

ANYMOUSE
Charleston, S. C.

▶ The instruction you quote does not appear to be in conflict with OpNav 3750.6D. However, copies of ship's personnel statements which have been appended to an AAR should be treated by ComCruDesLant in accordance with paragraph 70 of OpNav 3750.6D.

Very resp'y,

Headmouse

Short Cuts

Dear Headmouse:

Two third class electricians and a third class structures mech were checking the operation of a Stoof radome in connection with the operation of the landing gear. The aircraft was in the hangar but not on jacks. All three men noticed that the main mounts had ground locks on them but no one checked the nose gear to see if the C-clamp was in place. One of the electricians partially actuated the landing gear handle just enough to close the electrical circuit to move the radome although he knew that electrical power and hydraulic power was being applied to the aircraft. The nose gear collapsed, damaging the nose gear wheel well doors.

Apparently it had been the policy to actuate the radome in this manner with the obvious exception that a C-clamp must have been used in the past, since this was the first mishap of this nature that this squadron had.

The policy has now been modified such that the gear handle will not be moved while the aircraft is on the deck unless it is on jacks.

The C-clamp is an added safety precaution but should not be relied upon to keep landing gear from folding. It's better practice to move the gear handle only when the aircraft is supported by jacks.

ANYMOUSE

"They allus blow the horn ten times before they lower the elevator-r-r-r-r!"

▶ Thank you, Anymouse, wherever you are. Cause and reaction to this accident is typical of many reports NASC gets. That is, solid maintenance practices are ignored by outfits until something drastic happens to them. Then the "clamps" go on. People permitting such "shortcuts" will inevitably learn that while there is never time enough to do the job right the first time—there is always enough to do it right the second.

Very resp'y,

Headmouse

M-B Murphy?

Dear Headmouse:

One preflight check on the Martin-Baker ejection seat in an AF-1E (FJ-4B) is to insure that the eye on the end of the small cable (from the secondary ejection handle) is on top of the eye on the large cable (from the face curtain), so that if either cable slips loose from the seat it will be the secondary firing cable. A perfect example of a *Murphy*.

Why not design the two eyes so that they *cannot* be installed improperly, or hasn't M-B heard about *Murphy?*

ANYMOUSE

▶ The reason for placing the eye on the end of the small cable on top of the eye of the large cable is to give more positive separation of the alternate firing cable eye from the seat after ejection. This will ascertain positive face curtain separation when initiating ejection with the face curtain. This is not a factor when utilizing the alternate ejection method for ejection as the alternate ejection handle does not separate from the ejection seat.

Very resp'y,

Headmouse

THE GREAT MURGATROYD F

by LT Benjamin O. Bibb

Once upon a time there was a young lad named Muragatroyd Frunch. He was a strange youngster in some ways. For instance, he went in for fishing and hunting and other kinds of healthful outdoor scam instead of shooting pool and arranging his hair like most red-blooded American boys.

One summer day Murgatroyd trekked far back into the woods fishing. A thick overcast soon hid the sun, then he dropped his compass in the crick, and then with some suddenness he realized that he was far from home and had not the most muddled notion in which direction he could find mama's loving arms. He was, indubitably and totally, L-O-S-T. He yelled his head off but no one answered except some talky jaybirds. Then he had a brilliant thought. May he could make a sig-er-nal!

Forthwith he threw together a magnificent Boy Scout type fire and piled great gobs of green wood on it. A column of dark smoke rose through the trees. Shortly a watcher in a forestry tower spotted the smoke and naturally thought a scary old forest fire was aborning. He dispatched a fire fighting team which

Being hereby the tale of how our hero did find himself beset by difficulties; how he did gravely bethink himself and perceive an alleviation; how through perverse fate and sheer sagacity he did make a complete disorder of the entire circumstance; and how he did encounter the means to partially redeem himself through pluck, perseverance, luck and a modicum of study.

D FRUNCH (IFF) SIF SCANDAL

soon (1) found Murgatroyd, (2) put out the fire, and (3) placed Murgy on report for starting that fire in the woods during forest fire season.

The basic objective, however, was accomplished. Murgatroyd Frunch was again enfolded in mama's loving arms.

Time passed. Murgatroyd Frunch was already intelligent, handsome, witty, strong, courageous—even clean, reverent, and obedient—and now he was of age. Since the Presidency was filled at the moment, as a matter of course he became a Naval Aviator.

More time passed, Murgatroyd became an *excellent* Naval Aviator. With experience, yet. But one day he found himself in a similar situation as in his boyhood. He was L-O-S-T again. This time, though, instead of being under the trees under an overcast he was over the trees over an overcast, straddling a Mach 1½ horizontal smokestack. His navaids had become catatonic. He repeated his first experience; he first tried yelling for help. He keyed his microphone.

"(   )," said his transmitter.

" ? ," thought Murgy. He tried again.

"(   )," repeated his transmitter with the same inflection.

"!**!?¢# & !*#%!*¢!," thought Murgatroyd. Radio kaput, too.

Murgatroyd Frunch cast about in his brilliant type mind. A sig-er-nal, that's what he needed, again!

Starting a fire, for several reasons, did not seem to be the answer this time, however. Then a thought struck him.

"*Identification, Friend or Foe, with Selective Identification Feature PLACED IN EMERGENCY POSITION!*" he roared at his innocent and astonished

oxygen mask in vigorous and rounded terms. No sooner articulated than activated.

He placed his Mark X IFF (SIF) Master Control on EMERGENCY, set up a brisk left triangle flight path, and waited for an interceptor to lead him home. He was still waiting when his smokestack ceased breathing without so much as a by-your-leave-sir. He then got himself a running rocket start and terminated his trip vertically in a webbing seat under a most fragile looking nylon descent device. Meanwhile 1100 kilosimoleons was burying itself in forever unusable condition in the complaining ground below. Easy come, easy blow. It was enough to make one cry, and later thousands of taxpayers did so without reservations. Their moans could be heard all the way to Washington.

Still Murgatroyd Frunch was far, far from mama's loving arms. Basic objective *not* accomplished.

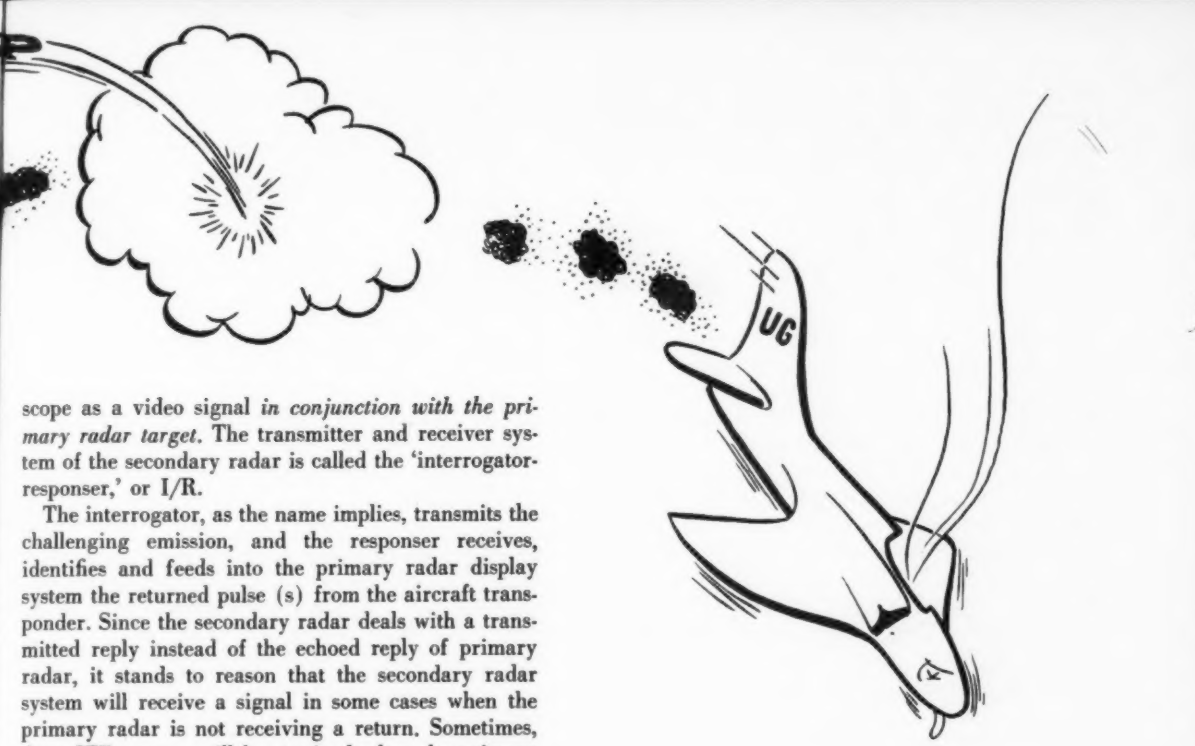
What hoppinged? Why does everyone who once smiled on and petted Murgatroyd Frunch, popular young Naval Aviator, now snarl at him and try to push him down the nearest stairs?

Basically because Murgatroyd, smart and handsome though he was, was also *INATTENTIVE* and *MISINFORMED!* He did not know that IFF (SIF) EMERGENCY transmits only on Mode 1, and that Air Traffic Control radars are normally controlling aircraft only on Mode 3. Therefore, even if dozens of Air Traffic Control radars were in his vicinity, they would not be seeing his EMERGENCY IFF code. *He should have also placed his Mode 3 on Code 77.* Then he would have been seen, intercepted, and enfolded in mama's loving arms, in that order, and everyone would still be beaming at him instead of barking at him.

Now Mr. Frunch was neither the first pilot nor will he be the last to be caught with his G-suit down by not knowing quite enough about IFF in general and IFF with Selective Identification Feature in particular. No one expects the pilot to have first-name speaking acquaintance with each pulse emitted by IFF, but the more he knows of the general operating whys-and-wherefores of the gear the less likely he is to find himself in an unexplainable situation that could have originally been resolved by correct use of IFF. So-o-o, let's take an overall look at the two types of IFF now in use. *Pay attention, Frunch!*

IFF, of course, stands for Identification, Friend or Foe. It was originally meant for identification purposes alone; that is, as an addition to a radar target that would state to a radar operator in visual terms, "This target is friendly." EMERGENCY would further state, "This friendly target is in trouble." IFF had to be associated with a radar set to make its visual display. It is therefore considered as a *secondary radar* as opposed to the *primary radar* with which it is associated.

A primary radar bounces an electronic emission from an object and receives the reflected return, then converts this electronic echo to video and displays it on the face of a radar scope. The secondary radar—IFF—transmits an electronic emission which is received by a 'transponder' aboard the target aircraft. The transponder then transmits one or more electronic pulses in return which are received by the secondary radar system, fed into the primary radar display system, and shown on the face of the radar



scope as a video signal *in conjunction with the primary radar target.* The transmitter and receiver system of the secondary radar is called the 'interrogator-responser,' or I/R.

The interrogator, as the name implies, transmits the challenging emission, and the responser receives, identifies and feeds into the primary radar display system the returned pulse (s) from the aircraft transponder. Since the secondary radar deals with a transmitted reply instead of the echoed reply of primary radar, it stands to reason that the secondary radar system will receive a signal in some cases when the primary radar is not receiving a return. Sometimes, then, IFF returns will be received when the primary target cannot be seen because it is too far away, or too small, or over the radar horizon. This 'IFF only' return may still be vectored and controlled within limitations.

The basic Mark X IFF system is relatively simple in operation. (Except to a person like the author, who firmly believes that everything that happens after pushing the button on a black box comes under the heading of pure magic!) The radar operator has three different pulse signals to send out as an interrogation, or challenge. The challenge signal is a double-pulsed signal; that is, two pulses sent out on the same frequency with a set time interval in microseconds between them. The three different signals are distinguished by different time intervals between the pulses. The three signals are called Modes, and are numbered as Mode 1, Mode 2, and Mode 3.

In the aircraft, the pilot operates his transponder through a Master Control box. In order to answer a challenge, the Master Control must be switched from OFF to either LOW, NORMAL, or EMERGENCY. In other words, the transponder is not activated until one of these positions is selected. (LOW and NORMAL actually refer to the power output of the transmitted signal; EMERGENCY will be discussed further below.) There are switches on the Master Control box that activate Mode 2 and Mode 3.

Note that there is no switch to activate Mode 1, for Mode 1 is always activated in basic Mark X IFF when the transponder is operating in LOW or NORMAL positions. The transponder sends out a single-pulsed signal as a Mode 1 answer, displayed on the radar scope as a single video line, or slash. The Mode 2 response is two pulses and is displayed as two slashes. The Mode 3 response is again a single pulse and is again displayed as a single slash.

Since all Mark X transponder reply on Mode 1, the radar operator whose control is set on Mode 1 sees as a single slash the IFF returns of all replying targets within range. When he switches his control to Mode 2 challenge, however, he will see only the IFF returns of transponders set on Mode 2. Similarly, when he switches to Mode 3 he will only see the returns of transponders set on Mode 3. Remember, however, that when the radar operator goes back to Mode 1 he will see returns from all Mark X transponders but will not be able to tell whether they are also on Modes 2 or 3 or not.

One of the most important things to remember about basic Mark X IFF is the EMERGENCY return. When the pilot switches his Master Control to EMERGENCY the EMERGENCY return is transmitted on *all* modes and therefore the video signal will be dis-

played on radars *set for any mode*. The EMERGENCY return is four slashes, and is highly distinctive and eye-catching. In other words, had Murgatroyd Frunch's trouble occurred when only basic Mark X IFF was in operation, his procedure would have been correct and he would still be happy-go-lucky and fair-haired. Woe betide him, though, *this is not true with the addition of Selective Identification, as we shall see.*

The transponder Master Control switch has an OFF position and a STANDBY (power on but not transmitting) position in addition to LOW, NORMAL, and EMERGENCY. Further, in addition to the two switches for Mode 2 and Mode 3, there is a three-position switch marked 'I/P—OUT—MIC'. This is a special use position for the IFF, originally designed for security purposes but now used mostly for identification purposes or to reduce IFF returns. When this switch is placed in I/P (Identification of Position) position, Mode 2 interrogations are answered. The I/P switch is spring loaded and must be held on. The Mode 2 switch *should not be on* when I/P is being used. When this switch is positioned to MIC, Mode 2 interrogations are again answered, but only when the pilot's microphone button is depressed. (OUT on all the enumerated switches corresponds to OFF.)

Now, in analagous terms, let us see what we can extract from an unknown aircraft target. Suppose you find yourself in a dark field one night. You suspect that someone else is in the field, also. You call out, "Is there anyone out there?" A voice answers, "Yes". You continue to question, "Where are you, in which direction are you traveling, and how fast?" The voice answers, "I am in the northwest corner of the field walking southward at a slow pace." This would be the information primary radar would give you on an aircraft target, but this is not enough information for your purposes. Now you ask, "Are you a member of the Crocodile Lodge?", and the voice answers, "Yes." This would be the information basic Mark X IFF would give you. This still is not enough information for your purposes. Now you ask, "If you are a Crocodile, give me your Lodge name and the password that authorizes you to be here tonight." The voice answers, "My Lodge name is Shrimpface and the password for this walk tonight is geet reet." This would be the additional information Mark X IFF (SIF) would give you.

As this analogy would indicate, the addition of Selective Identification Feature to Mark X IFF makes it no longer simple. It is a much more sophisticated but much more useful piece of equipment than the basic IFF.

Mark X IFF with its three modes did not provide enough individual identification of aircraft. It was found that the needs of both military and civil aviation required a fast and compatible means of electronically identifying aircraft for both air traffic control and security purposes. Therefore, the three modes in the IFF equipment were provided means to make separate and distinct displays within the modes. This was done by coding the IFF replies. The interrogator-responser at the radar location was provided with a decoder, and the transponder was provoided with a coding control allowing the setting of various codes in Mode 1 and Mode 3 (Mode 2 is also coded, but the pilot cannot set the codes from the cockpit. They are preset on the ground.) The Master

Mark X IFF (SIF) is designed to help the pilot through helping the controller.

Control box of the basic IFF remains unchanged. The coding control box is simply an addition to it.

The SIF-equipped transponder replies to challenges with several pulses instead of the one or two in Mark X IFF. (The double-pulsed challenges remain the same.) The pulses may be up to eight in number. The first and last pulses are called "bracket" or timing pulses, and are not, in effect, a part of the coding since they are transmitted with all codes. Within the bracket pulses there is time/space for six 'information pulses' to be transmitted at set intervals. These pulses are given a numerical value. The entire 'code train' would be (1 2 4 1 2 4). The first three information pulses are grouped to give the value of the first code number, and the second three are similarly grouped to give the value of the second code number.

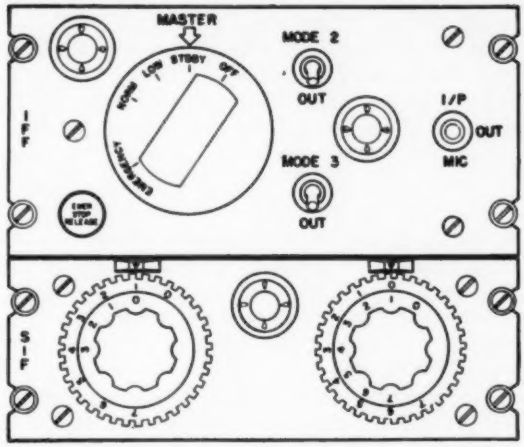
As an example, let us say that all three information pulses in the first grouping are transmitted by the transponder. The values of the three pulses are added to give the first code number, and 1 plus 2 plus 4 equal 7. In the second grouping of three information pulses, only the pulses valued at 1 and 2 are transmitted, with the pulse valued at 4 being left out. Again, 1 plus 2 equals 3, so the second digit of the code number is 3. Therefore the code transmitted was 73. In a simplified schematic, the code train would look like this—(/ / / / /   ).

Now that you know the numerical value of the pulses, let's show a few examples of coded responses using slant signs to indicate pulses transmitted but not showing their value. See how many you can decode correctly.

(/ / /)	Code 51
(/ / / / / /)	Code 77
(/ /)	Code 60
(/)	Code 02

You will have noted by now that neither the first nor last digit of the codes can go higher than 7.

The coding control box attached to the Master Control in the cockpit has two SIF coding dials with rotatable inner and outer rings imprinted with numbers. The left coding dial is for Mode 1 and the right for Mode 3. The outer rings set the first number of the code and the inner rings set the second number. Thus, 6 on the outer ring rotated to a position matching the pointer-indicator, and 0 on the inner ring rotated to the same position, would select 60 as a code. If you were using Mode 1 Code 60 in regular operations, then, you would have your IFF Master Control set on NORMAL, Modes 2 and 3 switches on OUT, and the Mode 1 coding set as above. If you were told to use Mode 3 Code 42, you would set the master to



NORMAL, Mode 2 switch to OUT, Mode 3 switch ON, and the Mode 3 (right-hand) coding dials to outer ring 4 and inner ring 2. Unless otherwise advised, Mode 1 should be left on 00 for normal air traffic control purposes.

The coding dials for Mode 3 have the numbers 0 through 7 on both the outer and inner rings. This gives a total of 64 codes available in Mode 3. However, in Mode 1 the outer ring has 0 through 7 but the inner ring only 0 through 3. The last digit of a Mode 1 code will never exceed 3. This gives 32 codes for Mode 1. (In other words, the final information pulse, value 4, is never transmitted in Mode 1 coding.)

As we have already noted, SIF EMERGENCY does not operate the same as does basic Mark X EMERGENCY replies on all modes. *SIF EMERGENCY replies only on Mode 1.* With SIF, when the pilot selects EMERGENCY position on his Master Control, the transponder replies to Mode 1 challenges by sending four complete code trains in the code set on the transponder. This return showing on the face of a radar scope is very distinctive, being four times as long as the normal code train return. But again remember that only GCI sites will normally be searching on Mode 1. Air Traffic Control Centers, Approach Controls, and other air traffic control agencies will usually only be on Mode 3. The nearest code in Mode 3 to regular EMERGENCY is the code with the fullest code train. What is this? Code 77, of course. Hence it follows that Code 77 was selected as the Mode 3 EMERGENCY. Hence again, in order to alert every possible radar source, the pilot using IFF/SIF *must* place his Master Control on EMERGENCY,

place his Mode 3 switch ON, and select Code 77 on his Mode 3 coding dial.

In addition to the big difference in EMERGENCY use with the basic Mark and the Mark X IFF(SIF), there is another important difference in the two. In SIF the I/P function is on Mode 1 instead of Mode 2. (Some types of SIF may also transmit I/P on Mode 3.) In Mark X the I/P video return looks the same as regular Mode 2 return. In SIF operation, the I/P position replies with two code trains in the code set on the transponder. This return is displayed on the radar during the time the I/P switch is held on and continues for thirty seconds after it is released. MIC position performs the same whenever the microphone button is depressed.

We have not discussed Mode 2 very much in the SIF equipment. This is mainly because Mode 2 is used for Air Defense Command purposes in the United States. It is of interest to note, though, that although most Mode 2 installations make use of six information pulses as do the other modes, there are provisions for installing 12 information pulses. These 12 pulses will have the same numerical value as the original six (1 2 4 etc.) with the exception that there will be four groupings of three pulses each instead of the two groupings now used. This will make up a four digit code with a total of 4096 codes possible in Mode 2.

As we already know, Mode 3 is used for Air Traffic Control (plus other use as noted below), and Mode 1 is the General Identification mode.

All military pilots are doubtless acquainted with the terminology used for IFF by controllers, so we will not go into these. However, you may hear at times a different terminology used by FAA controllers. The civil aircraft system corresponding to military IFF is called Air Traffic Control Radar Beacon System (ATCRBS). In voice phraseology, it is referred to as 'beacon'. The ATCRBS modes are lettered instead of numbered. Thus ATCRBS Mode A corresponds to military Mode 3. (In written terms, the FAA usually refers to the Air Traffic Control mode as Mode A/3.) In phraseology again, the FAA may use, "Reply Mode 3 code thus-and-so," corresponding to "Squawk Mode 3 code thus-and-so." Similarly, 'Ident' means the same as 'I/P' or 'flash'. Also, other services sometimes refer to EMERGENCY as Mode 4. It is expected that these differences in terminology and phraseology will be resolved to a single standard sometime in the future.

Certain codes in Mode 3 are set aside for special usage. For instance, several codes are reserved for NORAD use. At present, Code 02 is used for IFR flight at an assigned flight level when operating above Flight Level 240; similarly, Code 62 is used for VFR or VFR-on-top flight above Flight Level 240. (These codes may be changed in the future and pilots should keep informed through Flight Information Publications.) Some units or areas have certain codes reserved for use when Distinguished Visitors are aboard the aircraft.

The major assignment of Mode 3 codes, however, are for specific air traffic terminal areas. A terminal area may have as many as three codes assigned for aircraft operating from each field within its control area—a pick-up code, a feeder code, and a departure code. The pick-up code is used for identification purposes. The feeder code is used for the approach, but the pick-up and feeder codes may overlap in use to some degree. The departure code is used until the departing aircraft leaves the terminal area or is ordered to shift to enroute code.

500. When I have an emergency, I will place my Master Control on <u>EMERGENCY</u> and will also squawk Mode 3, Code 77.

Murgatroyd F[illegible]ch

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Mark X IFF(SIF) can be seen to have a myriad of uses. The big picture to remember is that it is designed to *help the pilot*, through helping the controller. Here are a few additional tips that will help the controller, also:

- Leave your Master Control on STANDBY while on the ground.
- Keep your Master Control on LOW while within ten miles of a terminal controlling agency. Normal power will probably 'ring' the radar scope.
- Shift immediately and positively to the required code when requested.
- Do not use an unassigned code under any circumstances.
- Once you have activated EMERGENCY IFF for a legitimate reason, leave it on until advised to shut it off by an authorized controlling or assisting agency.

Any questions, Murgatroyd Frunch? If not, then remain after school and write the following sentence 500 times; "When I have an emergency, I will place my Master Control on EMERGENCY and will also squawk Mode 3 Code 77." Except for your conscience, your sin of omission will then be expiated. Maybe. Class dismissed.

Oops—one moment, please. There was the time when an inexperienced controller asked a pilot to "squawk Mode 3 Code so-and-so". The pilot replied, "My parrot is sick." The controller immediately answered, "That's nothing. My Chihuahua is *dead!* Do what I told you!"[1]

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[1] Which is from pretty far out on the cob, but tell me—do *you* know any really funny stories about IFF?

Pilot Locator Devices

The following describes current locator devices carried by pilots. More detailed information can be found in "Where Am I?", Sept., 1961, APPROACH, and in Personal/Survival "Crossfeed" for 31 March 1962.

Item Designator	Freq. Trans.	Actuation/Mode	Transmission/Mode
PRC-17	121.5/243 msc (either, selectively)	Manual Tone Manual Voice Manual Receive	Unmod. CW Mod. Audio
PRC-32	243	Manual Tone Manual Voice Manual Receive	Unmod. CW Mod. Audio
PRC-49	243	Manual Tone Automatic tone when parachute is deployed Manual Voice Manual Receive	Modulated Tone CW Modulated Tone CW Mod. CW
PRT-3	243	Automatic tone when parachute is deployed	Intermittent 1000 cycle Modulated Tone CW

The PRC-17 is the Navy's oldest unit. It is being phased out by the PRC-32 which has no automatic actuation. The PRT-3 can be used in conjunction with the PRC-32. The PRC-49 is a transistorized version of the PRC-32 and has the beacon capabilities of the PRT-3.

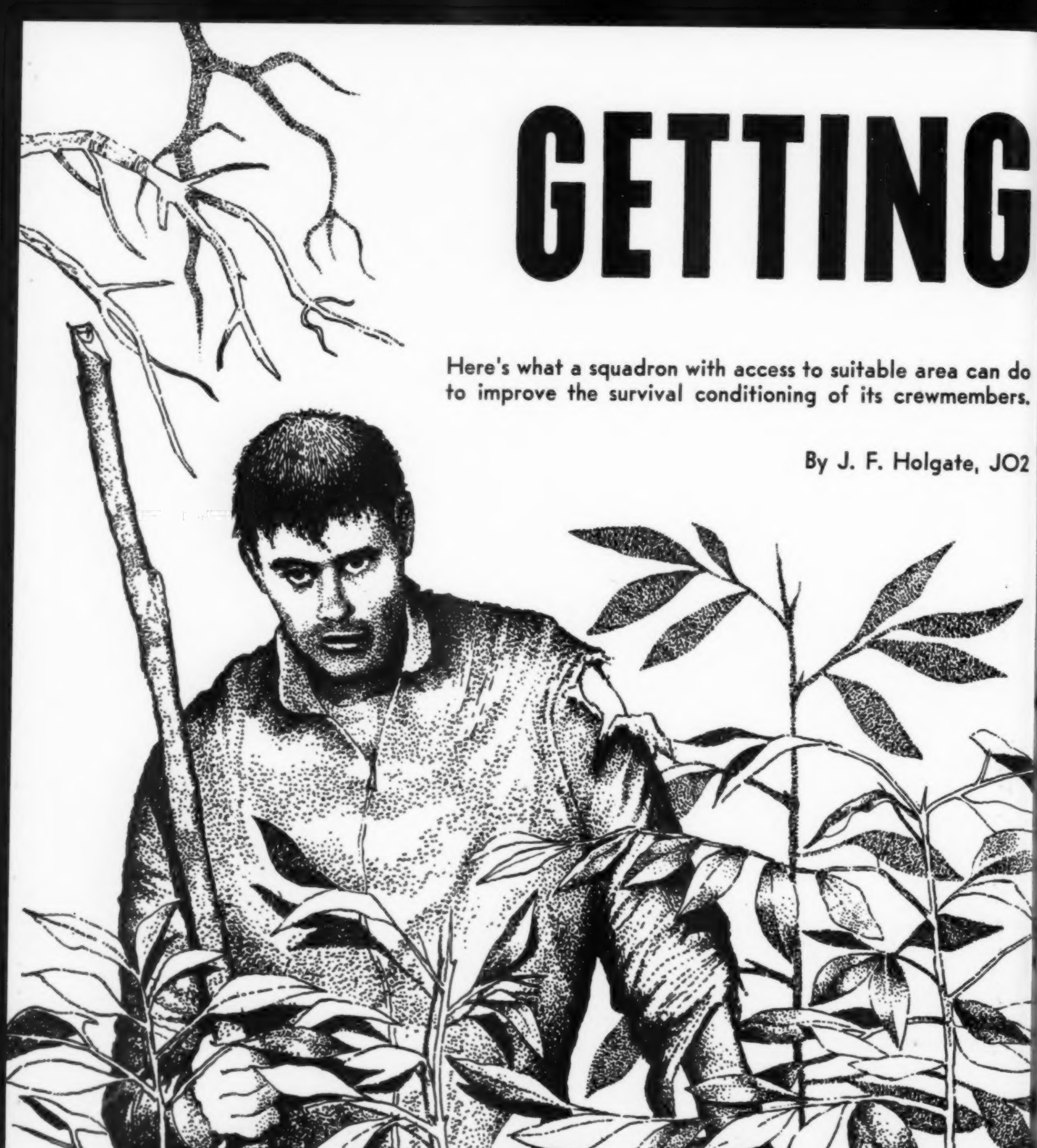
Tapes are available, on request, from the Naval Aviation Safety Center, to those activities desiring audio presentations of the three different tone modulations used in the various equipments. Some evaluation work has been done by fleet units wherein certain shipboard receiving equipment installations have been proposed in order to give rescue vessels an immediate ADF bearing acquisition on airmen, both during parachute descent and when on the surface. One such proposal suggested using the following equipments for both locating pilots' beacons and normal CIC work:

- The AN/URD—2,—2A (VHF), AN/URD-4 (UHF).
- The AN/ARA-25 which can be adapted to the AN/GRC-27. (This appears feasible since the AN/GRC-27 has a DF switch position and the AN/ARA-25 is used on the aircraft version of the AN/GRC-27. The power supply of the AN/GRC-27 should handle the AN/ARA-25. The 28 VDC two-ampere motor could be changed to a 110 VAC motor.)

GETTING

Here's what a squadron with access to suitable area can do to improve the survival conditioning of its crewmembers.

By J. F. Holgate, JO2



BACK HOME

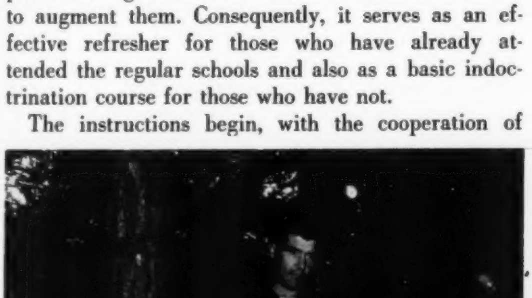
Survival training is almost useless to an aviator flying an aircraft in the best of condition. It is when his plane acts up or quits altogether, from either mechanical or combat causes, that training of this nature is a dire necessity. In simple words, aircraft are more easily replaced than pilots.

Being staunch believers in these loosely stated axioms, Attack Squadron 43, based at NAS Oceana, has made a point of trying to offer the fleet the best trained pilots in the Navy.

In order to accomplish this task they have initiated a special training program with the squadron to approach survival instruction from the most interesting and beneficial angle. This training is for both replacement and instructor pilots and as such encompasses all squadron pilots at one time or another.

The course, under the guidance of LT C. E. Garber and R. A. Bower, PR3, is not meant to replace the regular service survival schools but rather to augment them. Consequently, it serves as an effective refresher for those who have already attended the regular schools and also as a basic indoctrination course for those who have not.

The instructions begin, with the cooperation of



LT C. E. Garber gives the opening lecture on the necessity of survival training to a group of Navy pilots at Camp A. P. Hill, Virginia.

the U. S. Army, at Camp A. P. Hill in Virginia. It is in this wooded area that a class, ranging from 10 to 12 men, depending on the squadron's CarQual schedule, is introduced to the probability of their being in a survival situation. A lecture is given on the necessity of this kind of training. From this subject LT Garber goes right into realistic lectures and demonstrations on Food and Water Procurement, Improvisations, Day and Night Navigation (cross-country), Evasion Techniques, Compass Reading, Survival Fires and Appropriate Shelters.

During these lectures, a personal survival kit in addition to the Navy's kit is discussed which might include such items as a piece of surgical tubing, extra shroud line, fishing gear, a small pocket knife with the little blade honed to razor sharpness, an extra pair of socks, a small pair of pliers and some APCs and vitamins.

The improvisation lecture vividly points out that these things could be of the utmost importance if a pilot was unable for any reason to take his seat pan with him after a forced landing or a ditching. In such a situation he would have only the gear he carried on his person with which to hope to survive. But, through the lecture it is proved that this gear can be sufficient if the pilot is aware of the varied uses of these bare essentials. For instance, if he knew that his torso harness contains nearly 17 ft. of continuous webbing, even *mukluk* shoes could be made from it. His anti-G suit also has several uses such as being excellent flotation gear for crossing streams or rivers and its ability to hold approximately two gallons of water. Of course there are yards and yards of thread in this suit and the fasteners could easily be made into fish hooks for improvised food procurement gear. So, as the lecture goes, with a little pre-planning almost anything is possible.

After this initial briefing is completed, each man is issued an improvised seat pan which includes a compass, whistle and map of the area, a poncho, a snake bite kit, a water bag, purification tablets and

one tin of arctic rations. These rations are shared by two men who are designated as a team and are referred to by a team number from this time until the completion of the entire problem. Once the gear is inventoried the teams are taken on a day-navigation cross-country trip and each team is given a chance to experience this type of navigation by taking the lead for a period. Upon arrival at the destination the teams are split up for the rest of the problem and they go their separate ways to set up shelters in areas previously designated on each individual team's map.

They are given a couple hours of rest and then are taken by bus to a spot some distance from their shelters where an instructor accompanies them part way on a night-navigation problem. At this time they are introduced to the "walking stick," a stick cut from wood strong enough to support each man's weight and approximately three inches higher than the individual's eye level. This stick is held before the evadee as he traverses strange wooded country at night and acts as an effective warning of slopes, ditches, cliffs, holes, logs barring the way and unsturdy ground. It is also excellent protection for the eyes from brush, limbs, . . .

After each team has had a chance to get a taste of night travel and navigation through wooded country by leading the class for a short while, the instructor stops the group and, in the dark, shows them the effectiveness of small amounts of camouflage. They are then quickly briefed on the general location of the "aggressors" (squadron personnel who help to make the problem as realistic as possible and act as a safety measure). Students are warned to stay clear of broken trails, roads and, whenever possible, open areas where the aggressors may be waiting. After a review of the safety signals, three whistle blasts at one-minute intervals, to be used in case help is needed, they are sent on their way from different areas with instructions to evade the "enemy" and proceed to the "free area" where they are to sign in at a prescribed time and then proceed to their shelters, all the while remaining concealed and undiscovered.

The second day of the problem is also an escape and evasion endeavor for the teams. They then have to proceed to a designated area marked on their maps by each team's number. At this point they will find a piece of parachute with their team number on it in grease pencil. This is a simulated partisan contact. From here they proceed to a rendezvous area where each team meets with the instructor vehicle at a prescribed time and place and turns over the marked piece of parachute as proof that the contact was made. The teams then proceed cross-country, at night, to the new "free area" and sign in within a designated time limit before returning to their shelters for the remainder of the night.

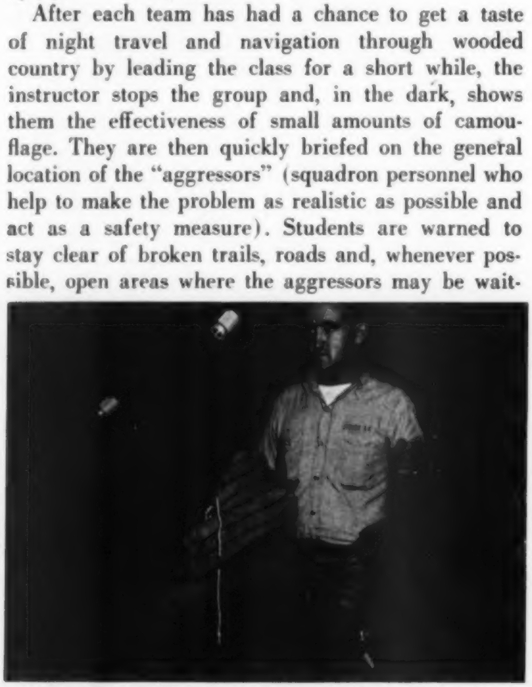
At 0600 Sunday all the teams are picked up and taken to an Army mess hall for breakfast and then it's back to Oceana for a critique of the whole exercise.

The espirit de corps and seriousness with which the pilots participate in the problem make it realistic and very profitable for them as well as the instructors.

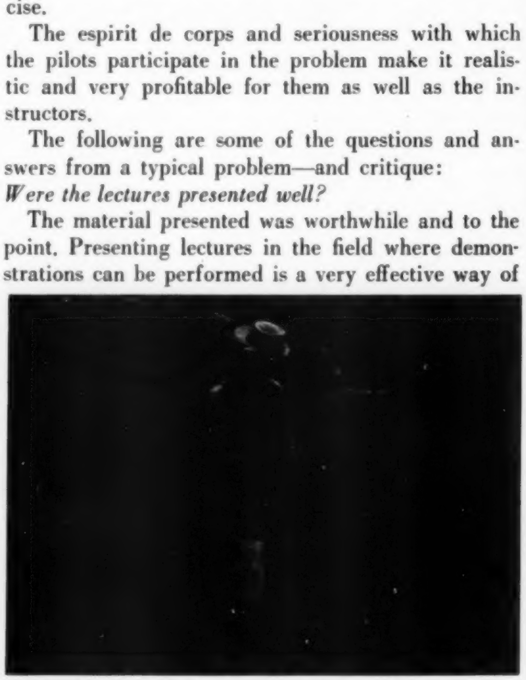
The following are some of the questions and answers from a typical problem—and critique:

Were the lectures presented well?

The material presented was worthwhile and to the point. Presenting lectures in the field where demonstrations can be performed is a very effective way of



R. A. Brower, PR3, shows what can be done with the 17 feet of webbing in the torso harness during the improvisation lecture.



Instructor shows students how to get around in the dark during the night navigation course.

A type of improvised summer "home," made from a parachute—an example of what can be done, with a little ingenuity.

gretting across the noteworthy points.

Do you think anything could be added or eliminated?

Perhaps there could be more briefs on terrain although I understand that much of this type of information was left out purposely in order to simulate realism.

It might be a good idea for the riggers to compile a personal survival kit such as was discussed for use during the lectures.

In the limited time available I feel that everything mentioned was educational and none of it should be eliminated.

Did you learn anything new in survival techniques?

Yes, night navigation is a problem previously not encountered.

I feel that I learned a great deal concerning the management of my personal gear.

The night navigation was a very important aspect

Student makes himself a walking stick, a stick cut from wood strong enough to support a man's weight.

to add to survival and evasion tactics.

I learned quite a few rules-of-thumb on edibility of plants, etc.

If I had been told prior to this problem that I could walk through *anything* on the blackest of nights with less than 1 inch visibility, I would have laughed heartily.

This was the most instructive survival training I have ever experienced.

Was the field problem important? If so what did you learn.

It was very worthwhile and I learned one very important fact; how not to dress on normal flights.

Yes, I learned a great deal about night navigation and the management of my personal gear such as food and water.

This was a very important problem and I learned very important facts on evasion and camouflage.

Yes, very worthwhile. I learned the usefulness of the walking stick and also gained confidence in evasion tactics.

Was the safety of health and person adequate in the field?

The general opinion of all concerned was that the safety aspect was more than adequate and that instructors knew at all times the approximate area in which the students were traveling. Consequently, they knew that help was readily available if it was needed.

The critiques bring out the fact that the most important aspect of the problem is the learning of the basics of escape and evasion and night navigation. This of course is shared with a by-product called individual discovery.

This course is given on an average of once every 6 to 8 weeks and since its beginning, approximately 120 pilots have gone through it and are now in the fleet.

All in all the course not only instructs the individuals in survival techniques, but also instills in them a great deal of self-confidence.

This is one case where the instructor feels that if his students hate and damn him, then he has accomplished his mission; the retention of training through vivid memory. ●

HYPOXIA

notes from your flight surgeon

THE two-plane T2V flight was a VFR high altitude navigation flight, estimated time enroute to destination, 1.7 hours. In the lead plane were a Lt pilot and a non-pilot NAO student. Four to 10 miles separation of the two aircraft was planned.

After about 1.5 hours from launch the NAO student noticed the aircraft was drifting off course. He called the Lt and asked him what they were doing. There was no answer. The NAO could see the pilot was slumped over and assumed he was having oxygen difficulties. He called him and told him to go on 100% oxygen. There was no response. At 42,000′ the NAO assumed control and called the pilot of the second aircraft for instructions. Fortunately the NAO had some previous T2V flight instruction. The pilot of the second plane instructed him to continue flying the aircraft on present course. All efforts to arouse the unconscious pilot were unsuccessful.

Near destination they orbited and made a gradual descent with the second pilot coaching the NAO down. The field was notified of the difficulty and they were cleared to land. Descending through 10,000′ the pilot began to stir and regain consciousness and immediately began to fight for control of the aircraft. The pilot and NAO fought for control to about 5000′, where the pilot became more responsive, assumed control of the plane and landed normally except for a low slow 90° position. They had 200 to 300 lbs. of fuel remaining. (The pilot said later he was forced to exert himself to the utmost in order to function at all.) Examined by a flight surgeon after landing, he was found to be suffering no ill effects.

The pilot's oxygen mask was checked and found to have a pin hole in one of the inlet valves. The exhalation valve was sticking and there was dust and debris in the exhalation port. When the inlet and exhalation valves were replaced, the mask operated properly. At intervals of one-half to one hour after takeoff, the pilot had removed his oxygen mask three times for periods of less than one minute to drink juice and milk, and to eat a sandwich and a boiled egg. Cabin altitude was 19,000′. Defroster, normal; heat moderately warm. After eating, he immediately replaced the mask at a comfortable level of tightness. The flow indicator functioned both on "normal" and on 100% oxygen. On several occasions the pilot placed the selector in 100% and "was satisfied" that the regulator and his personal equipment were operating satisfactorily.

Oxygen masks should be inspected and cleaned thoroughly as frequently as required by service conditions. Procedures are outlined in BACSEB 27-54.

Tractor Squeeze

WHILE attempting to connect a towbar attached to a HUP-2 onto the tow tractor, the brake rider was holding the bar with his left hand and the pin with his right. The towman started to back the tow tractor, which reacted slowly. He added foot throttle and the tractor began moving rapidly rearward. As he braked, his foot slipped off the pedal and onto the accelerator. The tractor continued into the aircraft and pinned the brakerider's leg against the aircraft.

Investigators concluded that the accident was caused by the towman's failure to keep the vehicle under constant control. The brakerider was responsible for his own injury by standing between the aircraft and the backing tow tractor. The towman, in overall charge of the operation, should have ordered the brakerider to take up a position where he would avoid injury, the report stated.

Inflate Vests

IT IS recommended that people again be reminded of how important it is to inflate their life vests. The possibility of the survivor being struck or going into shock, or rescue being delayed is too great not to inflate the mae west.

One man in this helicopter accident performed above average during the accident until the point of inflating the mae west. The fact that he also got into the rescue sling backwards even after his considerable training and work in rescue type operations indicates we must overlearn safety procedures until these procedures are reflexes.

—From an MOR

Rescue Confusion

AFTER the accident an injured F3H pilot, who landed wheels-up on the carrier because of a gear malfunction, had some suggestions on flight deck rescue:

"These points are not meant to be a criticism in any way," he stated, "but are merely to emphasize the need for more and better training using the actual aircraft and equipment on board.

"First, the face curtain pin was not inserted before they began unstrapping me and removing my equipment. It took quite a bit of time and effort to finally get this point across to the people involved and it kept me pretty concerned for awhile.

"Secondly, there were too many people around the cockpit and this confused the issue quite a bit. One or two men to do the work—preferably a pilot if one is available, along with the flight surgeon and a crash and salvage man—is all that would ever be needed until the time comes to actually pick the survivor up.

"This is a hard thing to say when I know that those people were all there out of concern for the pilot; but because of the confusion that existed, attempts were made to lift me up while my lower torso fittings were still connected. The rest of the operation went real well and I was lifted out like I was a crate of eggs, which made me quite happy to say the least."

No Life Vest

THE copilot of a UF-1 which ditched was not wearing a life vest. He exited via the forward starboard escape hatch which the plane captain had opened. Climbing forward onto the nose of the aircraft, he dove off and swam back under water until he could surface clear of the still-turning propellers. A crewman in the aircraft threw him a life vest which he put on. Ten minutes later he was in a life raft and in another 10 minutes, was taken aboard a crash boat.

OpNavInst 3710.7A states that life vests shall be worn during all seaplane operations.

Knotted Line

WHEN a plane guard helicopter ditched because of engine trouble, the surviving crewman was rescued by destroyer. As the ship came alongside the survivor's inflated life raft, destroyer personnel threw the survivor a number of shot lines. He caught one and was pulled to the ship. A larger line was thrown down to him and he was hauled up the side until his hands began to slip and he fell back into the water.

He shouted for someone to tie a knot in the line . . . this was done and he was successfully hoisted aboard.

This man could have been lost. A sling would have greatly facilitated this rescue.

Flight Deck Accident

ON AN overcast dark night a plane captain went aft on the starboard side of an AD-6 which had just landed. He was apparently checking for tie-downs. In the meantime another AD-6 had landed and was spotted about one foot behind the first plane. The engine was shut off. The plane captain, flashlight in hand, ducked beneath the starboard horizontal stabilizer and straightened up into the still-moving propeller blade. The blow knocked him to the deck. He was dead on arrival in sick bay. ●

FOD Prevention

FOD is still "Enemy No. 1" to the jet engine. It ranks also as "Public Enemy No. 1" to you and me. It takes a high toll of lives, extra work and our dollars. FOD can be arrested but it takes real effort on the part of all hands—Here's a rundown on what's happening and how it can be prevented.

Turbojet engines are still suffering foreign object damage (FOD), they are still being rejected to overhaul, and they are still being scrapped.

What are foreign objects? Anything which is not fastened down and can find its way through the engine inlet into the compressor qualifies. This covers a lot of territory: the pencil or security badge in your shirt pocket, the carelessly dropped pieces of lock wire, nuts, bolts, washers, wrenches, screwdrivers, birds, gravel, pieces of runway, rags—you name it and it's a foreign object if it gets in the compressor or turbine wheel.

Damage Potential

Let's look at a hypothetical engine for a second. This engine has a first stage compressor wheel three feet in diameter, blade tip to blade tip. The blades are six inches long. When this wheel is rotated at 8000 rpm, the linear velocity of any point on the blade will range between about 718 to 864 miles per hour.

Imagine what happens when a nut, a bolt, or any of the other foreign objects hits one of these blades. Also don't forget that the foreign object is usually moving and the effect is even greater. You've seen automobiles hit head-on at speeds much less than those mentioned and you should readily understand what happens to a compressor when foreign objects make contact with compressor blades.

Now let's take a look at the picture of the effects of FOD Navywide.

Effect of Damage

During an 18-month period, from October 1960 through March 1962, 749 of 5036 jet engines, or 14.8% were damaged by ingestion of foreign objects. This does not include engines removed from service for high time, or engines revealing basic type failures or discrepancies at engine disassembly. Shipboard operation also has its share. Review of the FUR system reports during the six-month period ending May 1962, revealed 16.2% of the engines were damaged during shipboard operations. Ship board operations were involved in 14.7% of the total

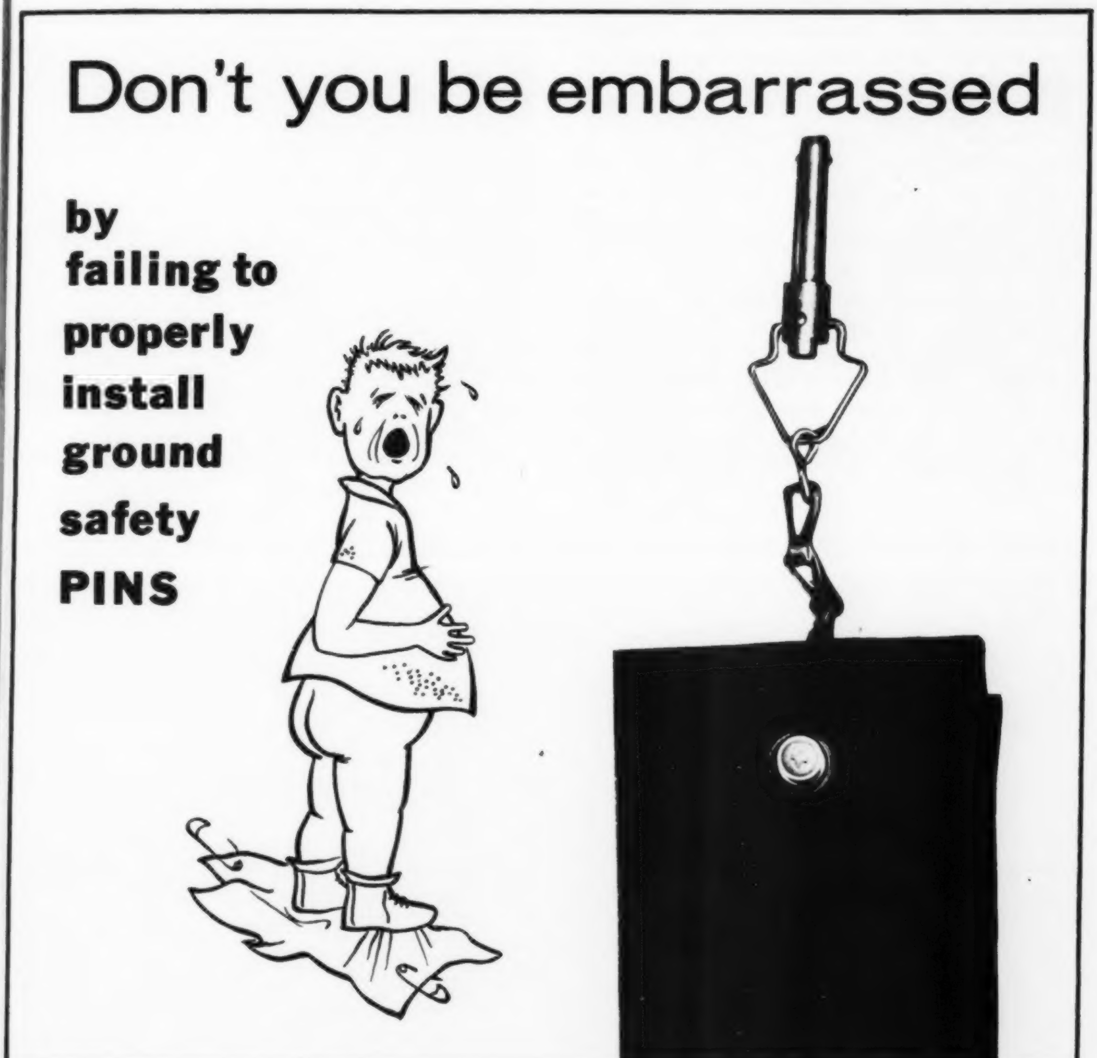
engines damaged by ingestion of foreign objects during the past 12 months.

The ingestion of flight deck debris, tire particles, birds and damage resulting from refueling operations accounted for 20% of the engines damaged by identified objects. The remaining reports reflect items of hardware, tools, test equipment, wearing apparel, engine and aircraft parts and support equipment, indicating either *careless handling, improper maintenance practices or inadequate quality control methods.*

Friend or Foe?

Aboard or ashore the ingestion of ground safety pins has become the number 1 problem area. An average of 2 engines per month are damaged this way.

One outfit reports a J65 just 12 hours out of overhaul swallowing a canopy safety pin. Damage cost $15,000—right expensive for just 12 hours of its normal 600 hours of operation. Furthermore, the outfit experienced 3 out of 4 FODs in a 4-week period because engines had ingested canopy safety pins!



The total costs of such damage is incalculable when one considers the loss of life and injuries involved in FOD-induced accidents, property damage, shipping charges, mission unreadiness and so on. There's no doubt about the problem being a serious one. It merits everyone's attention. What can you do about it?

Program Monitoring

First, a realistic FOD prevention program must be in effect.

The following action should be taken through assignment of specific responsibilities to squadron personnel by the FOD Prevention Officer. Checklists should be prepared for monitoring the program.

Housekeeping:

(a) Following quarters each day, a FOD walkdown should be conducted of the entire squadron area. All objects which could cause damage, such as metal, stones, wood, . . . should be removed. Personnel should report any existing or potential FOD hazard, e.g., chipped or deteriorated concrete, to the FOD Prevention Officer.

(b) Prior to flight operations each day, a follow-up inspection should be made by an assigned individual and a formal report be made to the FOD Prevention Officer regarding any discrepancies.

(c) During the aircraft secure check at the close of day, insure that duct and exhaust nozzle covers are in place and loose objects are removed from the area.

(d) At least once a week, clear the line area of all aircraft and support equipment. Sweep down with both the vacuum and magnetic sweepers.

(e) When runways, taxi strips or decks are in a condition which might result in FOD, a report should be made to the Commanding Officer of the station or ship concerned with recommendations as appropriate.

(f) Remove loose objects from all rolling stock and support equipment utilized in the vicinity of jet engines or aircraft.

(g) Inspect and clear the ramp area of all foreign objects within a 75-foot radius of the aircraft prior to each preflight, daily inspection and turn-up of the engine. Particular attention should be given to foreign objects in the pad-eyes.

(h) Inspect and clear the high-power turn-up ramp area of all foreign objects within a 150-foot radius of the aircraft prior to turn-up.

(i) Provide containers for loose objects picked up on FOD prevention and have them placed in strategic and accessible locations.

Maintenance:

(a) Properly install inlet duct and exhaust nozzle covers on all aircraft engines not scheduled to be flown. Be certain duct covers are intact and all component parts are secure. This also applies to aircraft in hangars.

(b) After preparation of the engine for installation, clean the engine exterior with a vacuum cleaner

Differences in FOD Prevention

FOD occurrence, removal and rejection rates are considered to be unacceptable. Since the major causes of FOD are poor maintenance and housekeeping practices, FOD is an unnecessary waste. Material availability and cost are adversely affected. In recognition of the problem, G. E. in cooperation with BuWeps activities, developed a program to investigate, define problem areas and initiate or recommend the necessary action to reduce FOD rates on the Navy J79 engines.

Investigation results showed activities with *low* FOD rates had:

All personnel sensitive to the problem
Directives in place—specifics
Directives implemented daily—formally
Foreign object checks—3 times daily
Duct covers used
Screens used
Ramps and taxi area clean

Activities with high FOD rates:

Personnel were not sensitive to the problem
Directives were not readily available—general
Directive implementation—loose
Duct covers—none seen
Screens—some available
Ramp and taxi areas—poor.

Effect: Activities with effective prevention programs and program management have about 1/7 the removal rates and 1/4 the rejection rates of those with ineffective programs.

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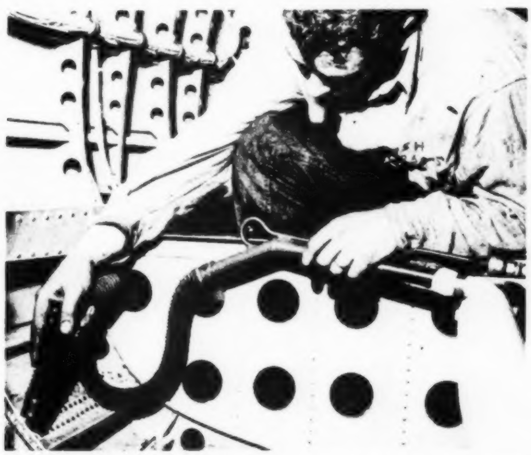
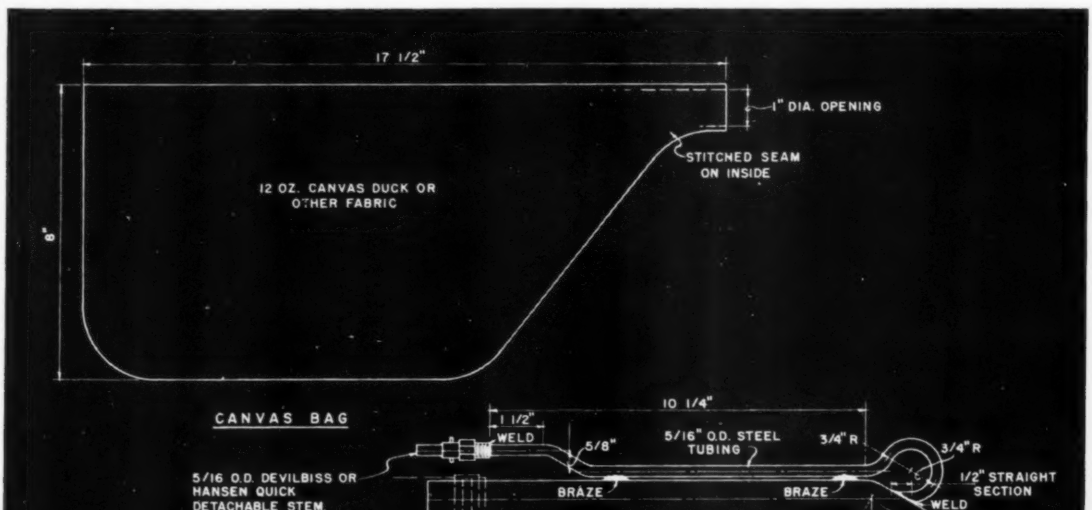
'BAZOOKA' SPECS

Readers have requested the specifications for the "Bazooka"—a homemade vacuum cleaner which appeared in March '57 APPROACH. Here they are along with a brief description: The Bazooka is small enough to be carried in a hand tool box. It is inexpensive and easy to manufacture from materials normally on hand within a squadron. It is particularly useful in cleaning residue such as rivets, filings, wire clippings and dirt from ducts, airframes and cockpits. It's a handy gadget for FOD prevention.

Mechanics find the homemade compressed-air-operated vacuum cleaner handy for cleanup after-service-changes.



Here are specifications for manufacturing your own "Bazooka." The tool has been in use by the O & R at Norfolk since 1949.



Winter FOD Guards

GUARDING against foreign object damage to aircraft engines must be a round-the-clock effort, shared by everyone. While this is a round-the-calendar job, winter ice brings unusual problems which require precautions both on the ground and in the air. Not only must ground crews keep runways properly cleared of ice, snow, and slush, but aircrews must give special attention to operation at altitudes where icing conditions may occur. Starting anti-icing equipment after the plane has passed through the area and acquired a thick coat of ice may loosen hard chunks which could be ingested. Jet aircrews, therefore, must be particularly alert to have their anti-icing turned on *before* they enter the danger zone.

to remove loose objects. If rollover rings are available, rotate the engine 360° clockwise and counter-clockwise.

(c) Conduct an FOD prevention inspection and sign an FOD prevention clearance on any aircraft which has received hangar maintenance work before that aircraft is returned to the line.

(d) When an engine is changed, the inlet ducts and engine compartment should be cleaned and inspected prior to installing the engine. The airframe should be inspected to insure that all loose bolts, nuts, washers, cotter pins, tools, lock-wire and other debris are removed. After the engine installation is completed and prior to buttoning-up the aircraft, the inlet ducts and engine compartment should be inspected for the presence of foreign objects. Quality Control and Maintenance personnel should insure that this has been done prior to signing inspection forms and checklist "sign-off" sheets.

(e) Do not at any time use the intake duct as a shelf for articles of any description.

(f) Do not lay sound helmets, tools, or any personal gear on an aircraft.

(g) Personnel working in or adjacent to intakes or cooling air ducts should remove pencils, tools, rags and all objects from shirt pockets prior to such work. (These items represent approximately 25% of the objects found which caused FOD).

(h) Personnel should not enter the aircraft parking area during flight operations or during periods of engine turn-up with any type of headgear on other than a sound attenuator with the chinstrap properly fastened.

(i) Perform thorough pre-turn-up and post-turn-up inspection of ducts and engine cavities. Remove shoes prior to entering duct.

(j) Inspect the ramp area adjacent to and in close proximity to the aircraft preflighting area. The area immediately aft of the aircraft should be inspected also to prevent damage to other aircraft from foreign objects blown up by the jet blast.

(k) Any aircraft/engine to be turned-up for maintenance checks, preventive maintenance or operation of electrical or electronic equipment should have intake duct mesh screen covers installed and they should remain installed until the aircraft is completely shut down.

(l) Hold the minimum possible revolutions per minute during turn-up on the line and while taxiing in order to reduce the probability of ingesting foreign objects.

(m) Consideration should be given to handling aircraft in such a manner that blast effects on parked aircraft are kept to a minimum.

(n) Do not taxi across another aircraft's intake or exhaust blast area, or in the propeller wash of reciprocating aircraft.

(o) Maintain proper taxi interval.

(p) Maintain proper takeoff interval.

Compliance to FOD prevention directives is mandatory—failure to do so, is *negligence*.

In summary:

- Foreign Object Damage is waste.
- Good maintenance practices and good housekeeping are the most significant factors in the prevention effort.
- FOD Prevention is an all hands responsibility.

So, as one oldtimer said, "there ain't no such thing as an isolated case! If it happened once, it can happen again, and again. . . ."

Whether you're flying an aircraft fresh out of check today, or are the line chief ordering two pulled in for periodics, take heed to isolated cases of missing tools.

DEPUTY INSPECTOR GENERAL FOR SAFETY, USAF, NORTON AFB, CALIF.

Misuse of Ordnance on Jet Aircraft

By CDR G. R. Otis
Aircraft Project Coordination Office, BuWeps

RECENT attempts to utilize practice bombs unsuitable for the aircraft involved resulted in the total loss of one (A 4D-2N) and minor damage to two others.* Underlying the events which led to this isolated but serious accident was an unfortunate misinterpretation of the appropriate regulatory documents together with certain assumptions which turned out to be invalid.

The documents concerned included Ordnance Publication OP-2216, Aircraft Armament Bulletin No. 161, NWL Report 1802, and the flight manual for the aircraft concerned. The assumptions made were to the effect that since the use of the bomb in question was not specifically prohibited for use on this aircraft, and had the same basic shape and construction as the one cleared for use, and apparently had been used by another squadron—Let's use it. The result, to quote was:

"What appeared to be a minor variation in ordnance loads from that prescribed in the flight manual proved to be of such a magnitude to cost the Navy a first line aircraft."

Each of the documents previously mentioned serves a specific purpose. OP-2216 contains general and specific information regarding bombs and fuses. AAB-161 deals with flight restrictions imposed on externally carried bombs stemming from functional or structural limitations of the ordnance items themselves, and is valid primarily for ordnance to be carried on reciprocating engine aircraft. The Naval Weapons Facility (Dahlgren) Report 1802 was a survey to determine the current use, availability, and requirements for practice bombs to aid in the determination of the adequacy of stockpiled practice bombs and requirements for the future. As for the flight manuals, at present, most of the manuals for the older types of service aircraft list only jettison and release instructions for stores that cannot be used to the full limit of the aircraft inflight envelope.

Restrictions on the use of aircraft ordnance are based on extensive flight testing to determine functional and structural limitations as well as separation characteristics of the various bomb/aircraft combinations. To verify, publish and maintain current a compilation of all possible combinations of ordnance for all service aircraft would be prohibitive from a budgetary standpoint. A more logical approach to the problem is to modify the flight manuals of each model aircraft to incorporate a supplementary table of ordnance items which have been tested and are authorized for carriage and release.

Such tables are already included in the flight manuals of the F-4 (F4H) and A-5 (A3J). Supplements have been recently added to the manuals of the A-4 (A4D) F-3 (F3H) F-4 (F4H) and AF-11E series aircraft for the same purpose. Similar action is being taken for all other service aircraft as applicable. Thus, the Aircraft Flight Manual is intended to be the basic authority for use of ordnance on each molel aircraft. Bureau approval must be obtained if deviation from the flight manual is desired. BuWeps instruction to this effect is being issued.

*A Mk 65 Mod 0 500 WSF Practice Bomb was substituted for a Mk 66 1000 WSF Practice Bomb for use on an Aero 7A-1 Bomb Ejector Rack on the A-4C aircraft The bomb disintegrated upon release.

Checklist

Checklist to prevent jettison of external stores while performing preflight tests.

- ✔ Conduct electrical tests in accordance with applicable HMI. ______
- ✔ Assure all ordnance switches off or safe position. ______
- ✔ Safety pins installed in all ejector racks with external stores. ______
- ✔ Remove breech caps and cartridges from all ejector racks. ______
- ✔ Primary and emergency release circuits connected. ______
- ✔ Remove safety pins. ______
- ✔ Apply external power. ______
- ✔ Check primary circuit using breech cap tester. ______
- ✔ Check emergency circuit using breech cap tester, assure circuit is broken at all stations when emergency handle is stowed. ______
- ✔ All ordnance switches off or safe position. ______
- ✔ Replace safety pins. ______
- ✔ Remove external power from aircraft. ______
- ✔ Replace cartridges and breech caps. ______
- ✔ Secure all fairings and doors on ejector racks. ______
- ✔ Sign preflight check sheet. ______

NOTES AND COMMENTS ON MAINTENANCE

'Road' Hazard

AS I was driving an NC-5 starting unit down the flight line at night, another NC-5 came into my path. To avoid hitting the vehicle and possibly killing the driver, I had to cut hard right and ran into an F8U tail section. I would recommend that small running lights be installed on the side of the NC-5 and similar units, as an aid to better night vision. *—MUGS*

Beat Murphy's Law

INCIDENTS have been cited wherein chip detector warning lights have been reversed indicating false malfunction of the wrong engine. It has been found that the port sump lights have been wired to the starboard engine and vice versa, when P2 (P2V) ASC-861 is incorporated.

Accordingly, a functional test inspection of the system should be conducted. Inspection may be conducted by grounding magnetic sump plug wire and viewing correct indicating light.

Electrical Grounding

ELECTRICAL grounding must never be taken lightly. Many points which appear ideal for attaching ground wires may be undesirable because of a coating of oil, grease, paint or other material. Therefore, the attachment of ground wires should be made to points of best grounding with the least chance of producing a high resistance connection.

For parking purposes a single ground wire of suitable length may be okay in some smaller airplanes but *not* adequate for servicing and maintenance operations. In the case of an airplane such as the B-47, *four* grounds should be attached.—*Boeing "Service News"*

Cat Hook-Ups

THE human element involved in hook-up of an airplane on a catapult is one of the most important factors affecting the success or failure of a launch; consequently, special emphasis must be placed on the human factor when providing a hook-up procedure which will be as satisfactory and as fool-proof as possible.

Human efficiency deteriorates after long hours of continuous operation especially when this operation is continued after dark. Time between launches must be realistic in order to provide enough time for hook-up and thorough inspection of both the hold-back and catapult hook areas. Lighting improvements in the catapult hook and holdback areas to aid night visual check were investigated in USS FORRESTAL during mid-June 1962 and test results were satisfactory.

Consideration was also given to adoption of standardized physical hook-up and inspection procedures for each airplane model. It was suggested a thorough check of the bridle be conducted as follows: Upon application of the tension load, each man responsible for the bridle terminal hook-up check for tension in each bridle leg by shaking the bridle laterally. Each man should then insure the bridle terminal is properly seated by placing a hand on the catapult hook point. If the point cannot be felt then the bridle is mispositioned. A third man (or perhaps, a senior or final checker) should be utilized to insure proper hook-up at the bridle apex/shuttle area by using the same physical method. This third man should also recheck both bridle terminals to provide a double check.—*NATC Patuxent River, Md.*

Electrical Connection

"GOOD" connections, by ordinary standards cannot in all cases carry the load. The terminals must be *PERFECT*.

There is no reserve carrying capacity or margin of contact to carry juice through dirty, distorted, improperly stacked or insufficiently torqued terminals.

Many of the problems attributed to the devices involved have been boiled down to simply poor technique at the connections.

Our only fix is to be sure every terminal is perfect —all workmanship and torquing must be as outlined by maintenance instructions—the overefficient nature of electrical apparatus demands it. ●

Change of Designations

Where possible aircraft model designations are changed in keeping with BuWeps Inst. 13100.7 of Sept. 1962.

LETTERS TO APPROACH

First Night Rescue?

Glendora, Calif.—"Night Helicopter Rescue" Nov. 1962 is a fine and well deserved tribute to LT Paul Frankenberger and his crew. However, it fails to give the richly deserved credit for a night helicopter recovery from USS KEARSARGE, then CVA-33, which occurred early in 1956 in the Far East.

Perhaps records of the KEARSARGE can give you the names, dates, and other details which I cannot, except the pilot may have been LT B. Willar flying an HU-1, shown in the 55-56 KEARSARGE Cruise Book. I have long since forgotten the name of the pilot for certain, but his feat and personal disregard for his own safety will not be forgotten by any of us who witnessed the incident.

It occurred while we were steaming through the fringes of a typhoon. The sun porch, now gone on the modernized KEARSARGE, was the lookout point for a few intrigued by the thrill of waves almost engulfing the bow. One finally did. Several men were injured and one was washed over the side. He was severely injured by the time he found himself clear of the ship.

Fortunately, a bow lookout saw him go, and a trailing destroyer was alerted and able to spot him visually in the last few moments of twilight, and hold him in a searchlight beam as darkness fell.

The seas were too high to come alongside or to lower a boat, and a helicopter was dispatched, coughing and sputtering with no warm-up before leaving the deck. The helicopter crewman had to lower himself into the water, place the injured man in the sling, and then climb back up to the helicopter hand-over-hand. The pilot elected to leave the man hanging in the sling while bringing him back to the carrier, where he raised and lowered the helicopter in motion with the pitching deck while the man was removed from the sling and placed into a stretcher.

The pilot and crewman received their acknowledgement from those of us that night in a thundering ovation that drowned out the noise of the storm. They deserve much better than to lose it now in the first line of your recent article.

D. G. FISH, LT

• We said "in what is believed to be the first night helicopter recovery from a ship." Glad to hear of another one.

Buddy Store Info

FPO, San Francisco—In reply to your request for "Buddy Store Info," page 46 of the November, 1962, APPROACH.

Recently in our A1H (AD-6) squadron, one of our pilots brought a buddy store with trailing hose aboard when unable to retract or jettison the hose. The decision to bring the A1H aircraft, with malfunctioning store, aboard was based upon our LSOs previously having waved such an aircraft aboard successfully. In both cases, the LSO had the pilot fly a slightly high, on speed approach and cut him for a no. 3 or 4 wire. The trailing hose and basket hit the ramp and, as the aircraft was arrested, came forward slightly curling under the fuselage. No aircraft damage occurred in either instance and store damage was limited to the hose and basket.

Our LSO, qualified to wave all Air Group types, feels that in event of a bolter with any of these types, the deceleration of the aircraft is not sufficient to allow enough flailing of the hose to cause damage on the flight deck.

Our pilots generally agree that bringing the ailing stores back aboard ship is a safe and sensible practice.

D. A. PAGE
AVIATION SAFETY OFFICER
VA-165

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request. Address: APPROACH Editor, U. S. Naval Aviation Safety Center, NAS Norfolk, Va. Views expressed are those of the writers and do not imply endorsement by the U. S. Naval Aviation Safety Center.

Visual Aid

FPO, San Francisco—Present aircraft paint specifications of gray and white provides little contrast under conditions of limited and reduced visibility. In order to provide improved pilot reference for formation flight in dense clouds and at night it is recommended that a design be painted along the longitudinal axis of all A4D external fuel tanks. Any design with a long ordinate dimension should prove effective.

A dark or bright colored design provides a reference discernable at considerable distance during periods of reduced visibility and in dense clouds is often the only reference. A4D fuselage lights illuminate the tank and seemingly project the design giving much more than a point on the lead aircraft. A design also permits ready identification of squadron aircraft at night aboard ship and in rendezvous areas in close proximity. Any thermal hazard from weapons detonation is considered to be of negligible consequences.

If the design is in the squadron

colors it adds the individuality to the squadron's aircraft which is difficult to achieve under the present paint codes. We use a facsimile of a bird with a long tail.—See photo.

Painting can be allowed and accomplished within the fine interpretation of painting specifications which prohibit the painting of designs on aircraft. A4D external fuel tanks are truly not part of the aircraft but carried stores.

This squadron has found the painted fuel tank to be an important aid in all weather and night formation flight.

R. F. SCHOULTZ
C.O. VA-93

• It does serve the purpose of increasing visibility at night and in clouds but might be objectionable when used during an actual combat mission.

How Do Houseflies Land on Ceiling?

SCIENTISTS have long conjectured on how houseflies accomplish such a seemingly intricate maneuver as landing on a ceiling.

Some thought the fly comes in head-first and upside down. Others studied flies and thought they detected a half-roll before landing.

High-speed photography has come up with the answer. The fly apparently can land several different ways.

The photos show that in the typical landing on the ceiling the insect approaches the ceiling at a near vertical angle. At about one body's length from lighting, it thrusts all six feet forward, its two forefeet poised like a diver's arms.

The cushioned and sticky forefeet absorb the impact as the fly humps its body forward to bring the other four legs into their four-point landing.

Details of the fly's long-held secret and the instrumentation required to record it are reported in *Science*, a weekly semi-technical publication of the American Association for the Advancement of Science. Author of the report is William G. Hyzer, consulting research engineer, of Janesville, Wisconsin.

It's a dead-stick landing in that the fly's motor stops its propeller (wings) just before the impact.

The pictures offered solace for proponents of the half-roll theory. Some variations in the landing maneuver were observed, he reported. In one, the fly went into a rolling movement immediately before touching down with its forefeet.

The final phase of this maneuver, he noted, resembled a sidewise handspring, or "cartwheel," and could account for the half-roll interpretation advanced by earlier observers.

Hyzer also timed the impact speed of ceiling landings at a "typical" velocity of 25 centimeters a second, a little more than half a mile an hour.

Any questions?

NATE HASELTINE

• You dear reader may find this useful during a lull in the happy hour conversation. But it's really just a gimmick to plug another serious landing problem—Ramp Strikes, page 1.

Know Before You Go

FPO New York—HS-11 realizes that even with the new improved SH-3A (HSS-2) *Sea-King* helicopter, ditching drills are important.

Despite the most advanced safety features installed in modern aircraft, experienced aviators recognize that accidents can happen. Since a helicopter crew has no parachutes, proper ditching (escaping from an aircraft which has made a forced water landing) techniques are more important than for crews of fixed-wing aircraft.

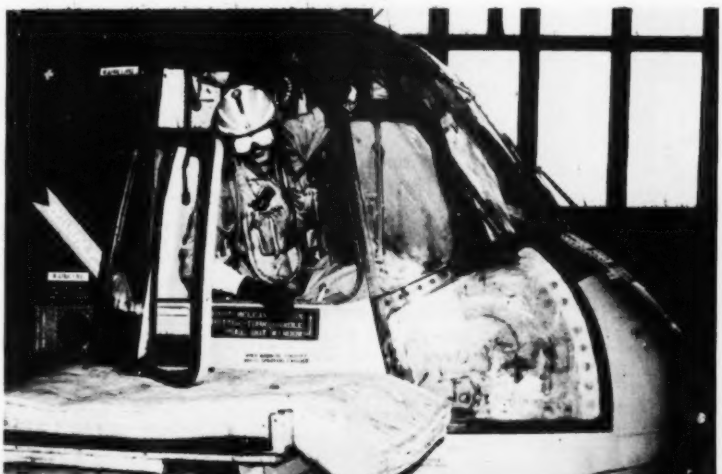
The *Sea-King* was designed to float on a moderate sea. But fire, a leak in the hull, unusual landing attitude, or other factors could cause the ship to leak. These drills, therefore, can save lives.

Escaping through the *Sea-King's* hatches involves more than just jumping out a window. When a man is wearing his winter Mark V anti-exposure suit, a survival pistol and holster, a PR-2 one-man life raft, a knee board and his mae west, getting through a small hatch successfully can be a problem. Several pilots discovered that extraneous gear sticking out of unzippered pockets hindered their escape. Under actual ditching condition, this could be serious.

Blinders are taped over helmet goggles to simulate complete darkness, since the *Sea-King* is an all-weather, day or night aircraft.

Ditching drills are performed with more than routine interest by pilots and crewmen, they want to know their way out in a hurry—if they ditch there usually isn't time to read the directions.

H. V. PEPPER
CO, HS-11



The skipper initiates ditching drills by being the first to exit from the bird.

NavWeps 00-75-510

approach

THE NAVAL AVIATION SAFETY REVIEW

VOL. 8 NO. 8

Purposes and policies: *Approach*, published monthly by the U. S. Naval Aviation Safety Center, is distributed to naval aeronautical organizations on the basis of 1 copy per 10 persons. It presents the most accurate information currently available on the subject of aviation accident prevention. Contents should not be considered as regulations, orders, or directives. Material extracted from mishap reports may not be construed as incriminating under Art. 31, UCMJ. **Photos:** Official Navy or as credited. Non-naval activities are requested to contact NASC prior to reprinting *Approach* material. **Correspondence:** Contributions are welcome as are comments and criticisms. Views expressed in guest-written articles are not necessarily those of NASC. Requests for distribution changes should be directed to NASC, NAS Norfolk 11, Va. Att: Safety Education Dept., if you are receiving the magazine free because of military or commercial contact status with the Navy. . . . IF YOU ARE A PAID SUBSCRIBER, address all renewals and change of addresses to Superintendent of Documents, Washington 25, D. C. **Subscriptions:** Single copy 35 cents; 1-year subscriptions $3.50; 2 yrs., $7.00; 3 yrs., $10.50; $1.00 additional annually for foreign mailing. **Printing:** Issuance of this publication approved by the Secretary of the Navy on 15 April 1961. Library of Congress Catalog No. 57—60020.

Flight Operations

Aero-Medical

Maintenance

Departments

Our product is safety, our process is education, and our profit is measured in the preservation of lives and equipment and increased mission readiness.

The Mystery of Aviation Safety

By Brigadier General L. B. Robertshaw, USMC
Commander, MARTCom

Each year the potential readiness of our Marine Air Reserve progresses almost routinely as a result of planned programs. The tangible improvements become obvious. However, among our greatest efforts, but least obvious of our contributions to Readiness, is our aviation safety program. The purpose of our program is to safeguard lives and prevent aircraft accidents—without jeopardizing readiness.

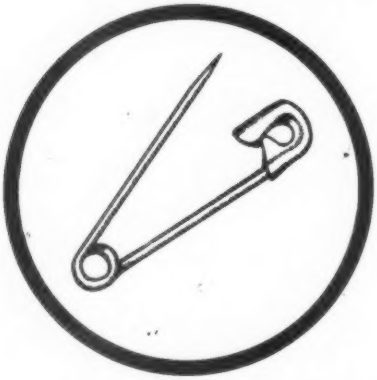
Peculiarly, almost mysteriously, the results of aviation safety sometimes appear to be in inverse proportion to the safety effort. For example, I have seen occasions when the Class A accident rate has spiraled upward right in the middle of a vigorous aviation safety campaign. On other occasions I have seen the personal efforts of a commander apparently disregarded by acts of gross negligence. Therein lies the mystery. Sure, it's discouraging but not nullifying. Every effort pays off, somehow. No course of medicine ever assured the elimination of sudden and sometimes unexplained death, and people haven't given up the study and practice of oral hygiene simply because it has failed to eliminate cavities and loss of teeth.

So, in aviation, where the prevention of accidents and the safeguarding of lives is essential, we must continuously improve our education, knowledge and attitude as professional aviators and aviation personnel through the study and practice of aviation safety. The pilots and crews who fly the planes, those who maintain and control them, and those who provide essential services for aircrews and equipment are the ones who will either cause accidents—*or prevent them*. Everyone involved must take a continuous and active, personal part in aviation safety education and practice—regardless of apparent results.

2d MAW's "HOT DOPE" Sheet

LIFT and DRAG

A safety pin



is a safety pin is a safety pin...

A cotter pin is also a 'safety' pin!

BOTH are simple, inexpensive.
BOTH work great-when installed properly!